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USER'S GUIDE

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RayTech
Navigator 4.0

Raymarine, Inc.

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Raymarine
ON BOARD

DISCLAIMERS AND WARRANTY

WARNING: This electronic chart is an aid to navigation designed to facilitate the use of authorized government charts, not to replace them. Only official government charts and notices to mariners contain all of the current information needed for the safety of navigation, and the captain is responsible for their prudent use.

The program and its charts do NOT excuse the user from carrying the required official charts and documents.

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This Product utilizes digital chart data, and electronic information from the Global Positioning System ("GPS") and weather information which may contain errors. Raymarine does not warrant the accuracy of such information and you are advised that errors in such information may cause the product to malfunction or give incorrect readings. Raymarine is not responsible for damages or injuries caused by your use or inability to use the Product, by the interaction of the Product with products manufactured by others or by errors in chart data or information utilized by the Product provided by third parties.

Except for the limited warranty regarding the magnetic media contained in the license agreement accompanying the Product, this Product is provided "AS IS" without warranty of any kind, either express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and any others which may arise from course of performance, course of dealing, or usage of trade.

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Printed in the U.S.A.

About This User's Guide

Guide Description

This User's Guide describes how to install and operate Raymarine's RayTech Navigator marine navigation software. It assumes that the PC on which the software will be installed meets the requirements for running Navigator (see Chapter 2 for details), and that all peripheral equipment that you intend to operate concurrently with Navigator has been installed and is fully operational and compatible. In many cases, you will be directed to refer to the user manual(s) that came with your peripheral devices for specific installation/operation instructions.

This Guide is intended for users with varying technical and nautical backgrounds, but assumes a general level of PC and related software environment experience, as well as a moderate knowledge of nautical terminology and practices. Certain portions of Navigator and this Guide are targeted toward the experienced sailor, and these areas are clearly identified as such.

Technical Accuracy

The technical and graphical information contained within this User's Guide, to the best of our knowledge, was correct at the time of printing. However, Raymarine's policy of continuous product improvement and updating may change product specifications and operating nature with out prior notice. As a result, unavoidable differences between the product and this Guide may occur from time to time, liability for which cannot be accepted by Raymarine.

Conventions

This section explains and gives examples of the writing conventions and margin symbols used within this Guide.

General Conventions

➢ Text that represents items you see on the screen are shown in **this font**. For example:

On the Polars screen, click the **Polar** tab.

➢ Text that represents text you are required to type-in is shown in **`this font`**. For example:

Point your browser to **`www.raymarine.com`**.

➢ When you are required to access/choose items from drop-down menus, the word <u>select</u> is used. Menus levels are shown separated by a forward slash "/". For example:

From the **File** menu, select **Setup/System**.

➢ When you are required to "press a button" on the screen, the word <u>click</u> is used. For example:

Click **Apply** to plot new variables after editing.

Margin Symbols

➢ When you see the symbol in a margin it means there is an important Note worth reading within the accompanying text.

➢ When you see the symbol in a margin it can indicate a tip, words to the wise, or simply some additional, useful information.

Product Technical Support

This section gives National and International telephone numbers, email and surface mail addresses, and an Internet address for use should you encounter any difficulties while using RayTech Navigator.

Telephone (United States)

Toll-Free:	1-800-539-5539 X<u>2333</u>
Standard:	1-603-881-5200 X<u>2333</u>
FAX:	1-603-864-4756

Telephone (Europe)

Telephone:	+44 (0)23 9271 4713
FAX:	+44 (0)23 9266 1228

Email Address

techsupport@raymarine.com

Mailing Addresses

United States:	Raymarine, Inc. 22 Cotton rd, Unit D Nashua, NH 03063-4219
Europe:	Raymarine Ltd Anchorage Park Portsmouth, Hampshire England PO3 5TD

Internet

www.raymarine.com

Table of Contents

Chapter 3 - Using Navigator's Interface 3-1

Chapter 4 - Working With Charts and Routes 4-1

Chapter 5 - Advanced Navigator Functions.. 5-1

Welcome to RayTech Navigator

This User's Guide describes how to use Raymarine®'s RayTech Navigator marine navigation software (Figure 1-1). RayTech Navigator operates within a standard Windows® environment, and enables you to utilize the latest digital charts and Global Positioning System (GPS) instrumentation to help you pilot your vessel to virtually anywhere in the world. Navigator easily interfaces with your boat's onboard navigational systems, offering you the flexibility to allow Navigator to autopilot your vessel to any destination you choose to plot. Navigator also incorporates the capability to download the latest weather and oceanographic information and display it on any chart, thus keeping you apprised of foul weather near you or your destination. Furthermore, Navigator is the perfect choice for the serious sailor or fisherman, offering advanced optional modules that enhance Navigator's route-plotting and fish-finding performance. The subsections that follow detail the sophisticated capabilities and features of RayTech Navigator.
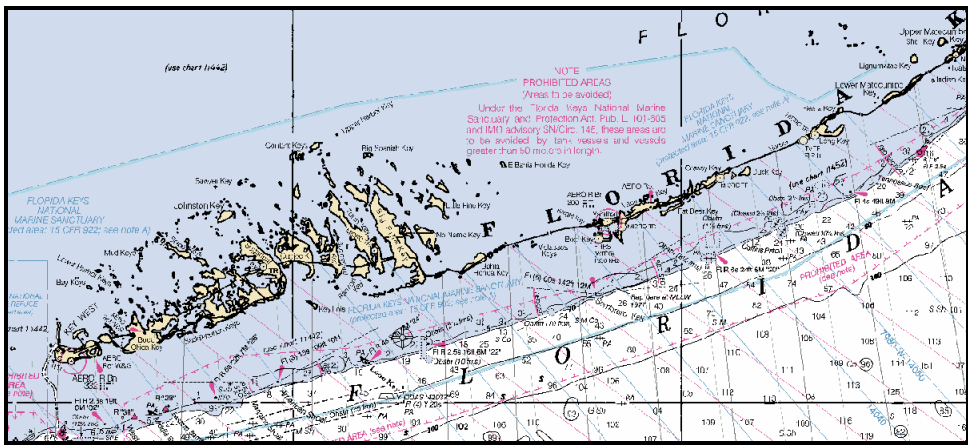
Figure 1-1. Typical RayTech Navigator Chart Screen

Easy Marine Navigation Using Routes and Waypoints

RayTech Navigator takes the guesswork out of marine navigation by enabling you to easily chart, plot, and execute simple or complex routes. A route is composed of a series of waypoints that you select on the screen, with each waypoint denoting a certain position along the path of the route. A route typically has a starting waypoint and an ending waypoint, and as many intermediate waypoints as you need or want. Using Navigator, you can create a route to any destination with a few simple clicks of the mouse, and then follow it manually or enable your vessel's autopilot to follow the route/waypoints you have designated. Routes and waypoints can easily be changed "on the fly," should weather or other factors necessitate a change in course.

Multiple Chart Formats for Flexibility

Navigator uses the latest digitized versions of the paper charts traditionally used in marine navigation, and supports a variety of popular chart formats:

- C-Map® NT
- Maptech® NOAA/BSB
- Maptech PCX
- Maptech Photo Regions and Topographical Charts
- SoftCharts® Nautical Charts and PhotoNavigator

These charts fall into three basic types:

- Vector – A paper chart that has been digitized into a format consisting of line segments. Vector charts can be easier to read than a rasterized chart, but may not include the level of detail found in Raster charts. The C-MAP chart is an example of a vector chart.

- Raster – A paper chart that has been scanned into a high resolution image. A raster chart has the advantage of being virtually identical to the original paper chart from which it was scanned. The MapTech NOAA/BSB and PCX charts are examples of raster charts.

- Aerial Imagery – A high resolution, geo-referenced rasterized photograph taken from aerial or satellite sources. You can overlay your vessel's position on such an image, and get a visual estimation of your position with reference to actual, photography-based landmarks. The MapTech Photo Region chart is an example of an aerial imagery chart.

Comprehensive Weather/Oceanographic Reporting

Navigator offers you the capability to download and display the latest weather and ocean conditions, and then superimpose this information upon your charts in several layers. Weather and oceanographic (sea tides and currents) files (in GRIB format) can be downloaded directly from the internet or requested via email. After you have acquired your files, you can fully animate them to show the predicted weather and ocean currents over a specified period of time. Typical weather files contain information in 6, 12, and 24 hour intervals, covering a period of several days. Navigator can further break this information down into intervals as small as 30 minutes, giving you a comprehensive presentation of atmospheric and marine conditions.

Advanced Graphical User Interface with Customizable Toolbars/Displays

You operate Navigator via an easy-to-use Graphical User Interface (GUI) complete with many customizable Toolbars, Function bars, and "floating" Databoxes (Figure 1-2). Using an intuitive menu hierarchy, you can display only those tools that you commonly use, or customize screens to show you only pertinent information, with just a few mouse clicks. You can zoom deeply into charts to display the maximum level of detail for the region you are in, animate weather and oceanographic files to monitor the meteorological events in your area, and create comprehensive logs containing virtually every piece of data that you might encounter and collect on a voyage. Navigator's flexible GUI enables you to tailor its powerful resources to suit your needs quickly and easily.
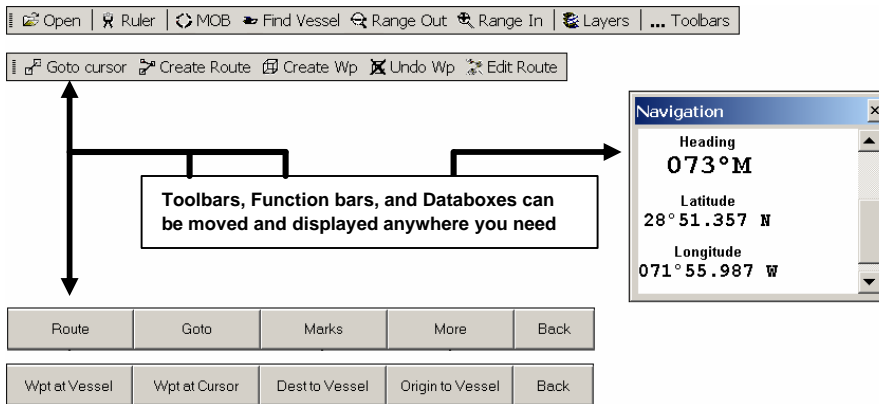
Figure 1-2. Navigator's Toolbars, Functionbars, and Databoxes

Integrates with Raymarine's SeaTalk® and NMEA 0183 Data Output Devices

Navigator is designed to work transparently with Raymarine's SeaTalk data communications package, or any other device that outputs data in NMEA 0183 format. This enables parameters such as Heading, Wind Speed/Direction, Sea Temperature, and a variety of others to be accessed and displayed within Navigator. Navigator can also connect to such onboard systems as Ockam, B&G, and KVH via a standard RS-232 data cable. This enables the information collected by Navigator to be relayed and displayed on your vessel's standard onboard instrumentation systems.

Navigator also connects to Radar systems that are capable of outputting Cursor Range and Bearing, and also to ARPA Radar systems. This allows targets identified by Radar to be plotted on directly onto Navigator's chart displays. You can also connect Navigator to a variety of proprietary instruments, and generate comprehensive log files which can then be analyzed from within Navigator or saved and exported for future external analysis.

3-D Contour Display

Navigator's advanced 3-D Contour Display shows your vessel, the ocean floor, and other related information using a 3-D vector-style display. This enables you to view any area, such as favored fishing and sailing spots, harbor entrances, and so forth, within a full, 3-dimensional window. Images can be rotated 360° so you can view your vessel's position from virtually an angle. 3-D Contour gives you useful navigational perspectives that you might not be able to ascertain from a conventional display.

The 3-D Contour Display includes:

- Past navigational markers

- Depth markers

- Transducer cone images

Optional Modules

RayTech Navigator offer two comprehensive optional modules to increase Navigator's capabilities: Sail Racer and Fishing Pro.

Sail Racer Module

Navigator's Sail Racer Module is targeted toward the professional sailboat racer, and includes DataTrak, Polars, Route Optimization, Advanced Weather Routing, Pre Start display, Navigation Numbers, and a specialized Racing toolbar.

- DataTrak is an instrument-recording program that captures a variety of incoming navigational and performance-related data and displays it on time-based graphs in multiple windows.

- Polars uses a group of variables (such as apparent/true/ corrected wind angles, boat speed, heel/pitch, and so forth) to determine what heading you should set your boat upon to achieve the best possible speed under varying wind conditions. Analysis results are displayed using multiple graph plots which you can modify (edit) to suit your needs.

- Route Optimization determines your ideal route based upon ocean current, wind speed and direction, in addition to your vessel's Polar characteristics, then plots this route upon the chart you desire.

- Advanced Weather Routing consists of detailed, 7-day animated weather files, text-based advisories for North American coastal regions, and offshore forecasts/advisories.

- The Racing toolbar displays special icons that are used within racing environments such as The America's Cup, and enables you to set marks and courses quickly and accurately based upon GPS or laser-guided input.

Fishing Pro Module

The Fishing Pro Module enables you to use Navigator to easily locate the world's best fishing areas using up-to-the-minute, satellite-based oceanographic data.

The module includes:

- The latest ocean temperature data presented as overlays upon your navigational charts to aid you in finding the warmer locations where fish may be hiding.

- Plankton content areas of the ocean presented as overlays upon your navigational charts so that you can easily identify clear, fish filled waters.

- 3-D bathymetric charts to precisely identify ocean bottom contours, enabling you to readily pinpoint the areas where fish are more likely to concentrate.

- Complete engine monitoring capability, which displays a realistic on-screen gauge cluster (including tachometer, oil pressure, turbocharger boost, and more). This feature allows you to easily check your vessel's engine-related systems from within Navigator.

Chapter 2
Installing the Software

Overview

This chapter explains how to install RayTech Navigator onto your PC, and contains the following:

- Minimum and recommended system requirements

- How to set your PC to display Navigator in optimal color

- Installing Navigator from CD-ROM

- Installing Navigator from the Internet

> **Note:** *How to connect external devices such as GPS, Radar/Sonar, and autopilots is explained in Appendix A, "Connecting Peripheral Instruments."*

Before You Begin

Before you can begin installing Navigator, you need to make sure that the PC you intend to use meets the minimum hardware requirements for running the software. This subsection lists the minimum and recommended hardware requirements that your PC must comply with to properly run Navigator. It also explains how to set your PC to display the best color scheme within Navigator, and also how to connect any peripheral devices (instruments) that you may have.

Hardware Requirements

This subsection lists the minimum hardware requirements that your PC must conform to in order to run Navigator properly.
While Navigator is designed to run successfully on the minimum configuration, we also include a recommended hardware setup that ensures optimal performance from the Navigator software.

Minimum System Requirements:

- Pentium® III
- 64MB of RAM
- 100MB available free space on your disk drive
- Monitor capable of displaying 640 x 480 resolution
- CD ROM drive
- Windows 98/ME/2000/XP (**will not run on Windows 95/NT4**)

Recommended System Requirements:

- Pentium III or higher
- 128MB of RAM or more
- NVIDIA® GeForce graphics card
- Windows 2000/XP

Setting Your PC Monitor's Colors for Best Display

To fully utilize Navigator's color display properties, we recommend that you set your PC's monitor to the highest color display/resolution setting that it can support above 256-colors. (It is important to note that Navigator will not run if 256-colors, or less, are selected.)
This is typically done by displaying the Desktop Properties screen in Windows (right-click the mouse with the cursor on your desktop), then clicking the **Settings** tab. Choose the highest color setting your monitor and PC can handle. Refer to your PC/Windows user manual for more information about setting display colors and resolution.

Installing Navigator

The steps you follow to install Navigator depend upon whether you are installing from a CD or from Raymarine's Web site on the Internet. Both of these methods are explained in this section, and both consist of a short sequence of installation wizard screens containing simple steps that you must complete. After you have successfully installed Navigator, you will need your Navigator License Key(s). A License Key is a sequence of digits and characters you enter initial configuration (explained later in this chapter) to activate Navigator and enable its various options modules. You need a unique License Key for Navigator, and one for each optional module you are adding. These keys can be purchased for immediate use on the Raymarine Web site.

The subsections that follow explain how to install Navigator.

Installing From a CD

To install Navigator from a CD:

1. Insert the CD into your PC. After a moment or two, the InstallShield Wizard Welcome screen (Figure 2-1) is displayed.
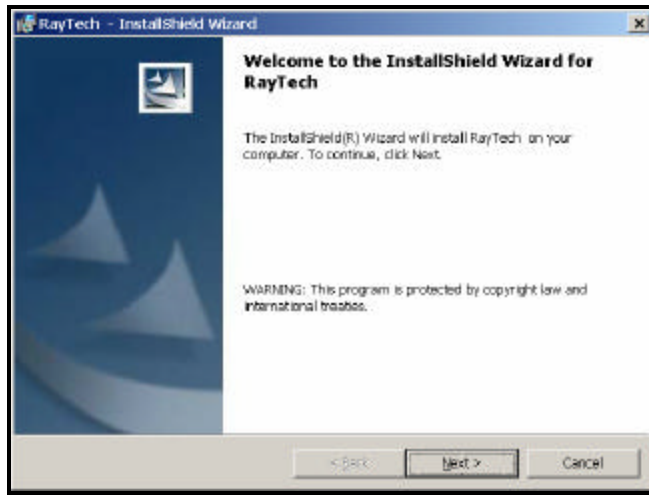
Figure 2-1. InstallShield Wizard Welcome Screen

2.   Click **Next**. The InstallShield Wizard (ISW) License
      Agreement screen (Figure 2-2) is displayed. This screen
      contains Navigator's Licensing Agreement/Legal Disclaimers.
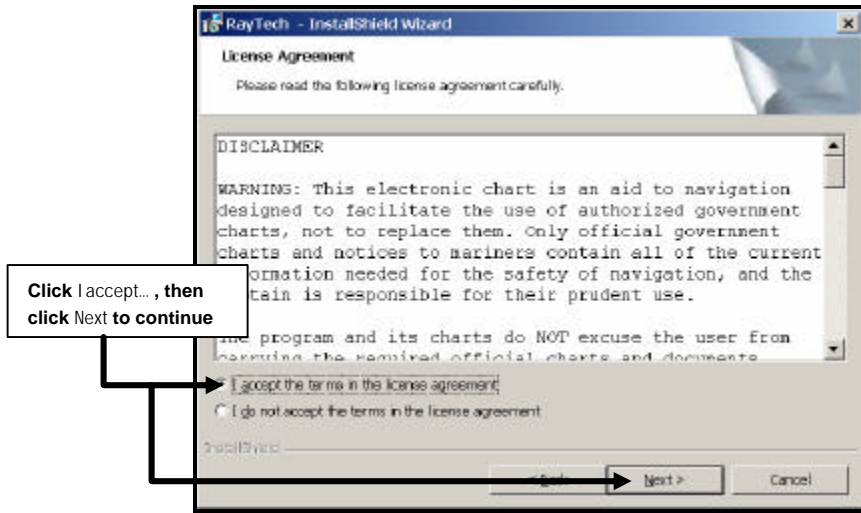
Figure 2-2. InstallShield Wizard License Agreement Screen

3. Make our Legal Department happy by reading all the text, then click the checkbox beside "**I accept** …" and click **Next** to display the ISW Customer Information screen (Figure 2-3).
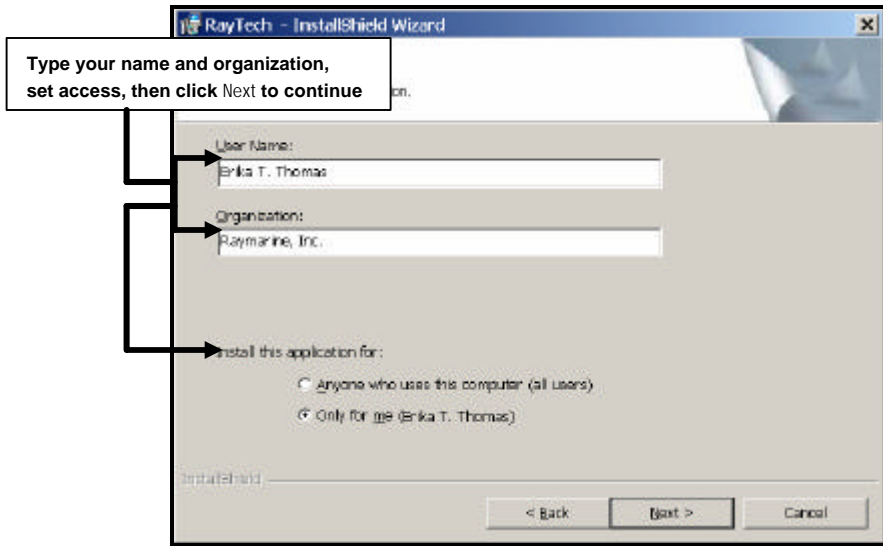
Figure 2-3 InstallShield Wizard Customer Information Screen

4. Type the name of the person and the organization to whom this version of Navigator is being licensed, then choose whether you want Navigator to be used just by that specific individual or by anyone with access to the computer. Click **Next** to display the ISW Setup Type screen (Figure 2-4).
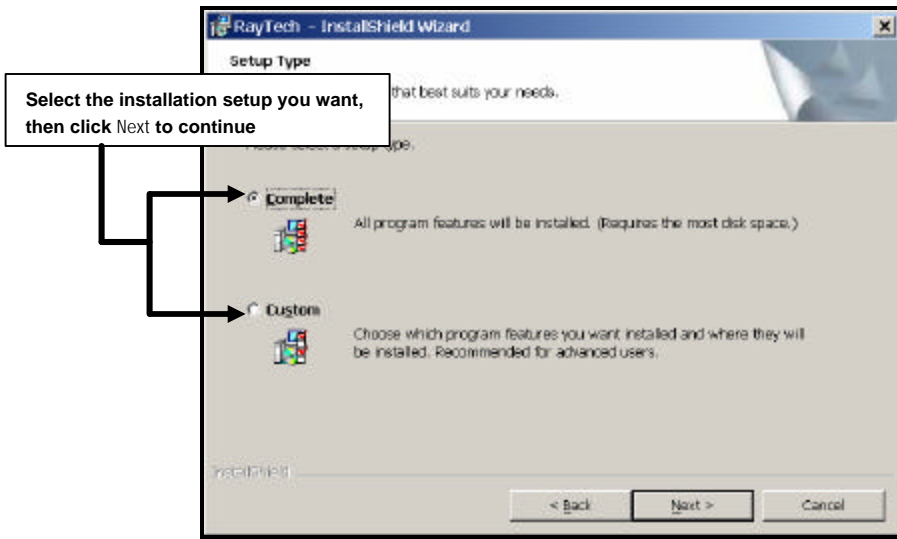
Figure 2-4 InstallShield Wizard Setup Type Screen

The ISW Setup Type screen allows you to choose which components of Navigator you want installed. The choices are as follows:

> ➢ **Complete** – Installs Navigator and all subcomponents

> ➢ **Custom** – Installs only the Navigator subcomponents you choose (A selection screen is displayed after you pick this option and click Next.)

5. Click **Complete** or **Custom**, then click **Next** to continue.
    If you select Complete, skip to Step 10.
    If you select Custom, continue with this step.

    The ISW Custom Setup screen (Figure 2-5) is displayed, and enables you to select the Navigator components you want installed. As shown in Figure 2-5, select the drop-down menu beside a component, then choose an installation approach from the displayed menu items.

First, click drop-down menu beside component, then, choose the method of installation

RayTech - InstallShield Wizard

Click on an icon in the list below to change how a feature is installed.

RayTech

This feature will be installed on local hard drive.

This feature, and all subfeatures, will be installed on local hard drive.

This feature will be installed when required.

This feature will not be available.

Feature Description

47KB on

Click Space to check the space available on your drives

Help   Space   < Back   Next >   Cancel

Figure 2-5. InstallShield Wizard Custom Setup Screen

The ISW Custom Setup screen choices are defined as follows:

➢ **This feature will be installed on local hard drive** – installs selected component only

➢ **This feature, and all subfeatures, will be installed on local hard drive** – installs selected component and all related subcomponents

➢ **This feature will be installed when required** – **?????**

➢ **This feature will not be available** – does not install the selected component

Keep in mind that you need a License Key for each Optional Module you are installing in addition to Navigator.

6. Select the components and the installation methods you want, then click **Next** to continue. The ISW Ready to Install screen is displayed (Figure 2-6).
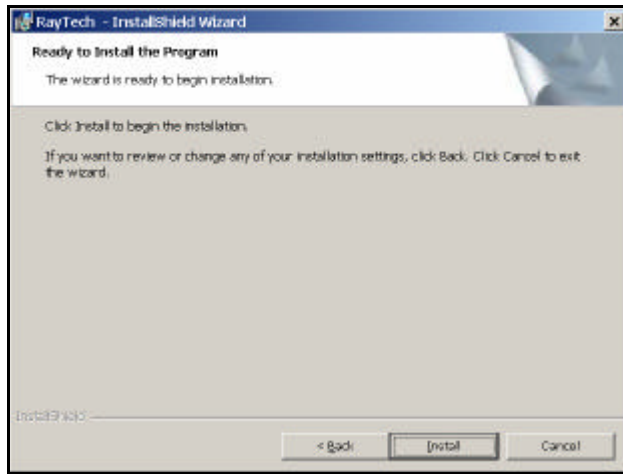
Figure 2-6. InstallShield Wizard Ready to Install Screen

7. Click **Install** on the ISW Ready to Install screen to begin the installation. The progress of the installation is displayed on the screen, and after a few moments, the ISW Completed screen (Figure 2-7) appears.

8. Click **Finish** to complete the installation.
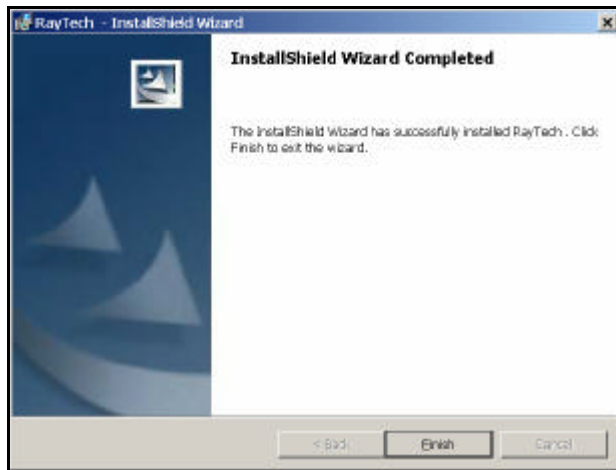
Figure 2-7. InstallShield Wizard Completed Screen

Installing From the Internet

Installation from Raymarine's Web site is very similar to installing from a CD.

To install Navigator from the Internet, do the following:

1. Point your Internet browser to:

    www.raymarine.com/raytech

2. Follow the instructions on the screen to download Navigator.

Chapter 3
Using Navigator's Interface

Overview

This chapter shows you around Navigator's user interface, illustrating and explaining the functions and components of the following:

- Navigator main interface

- Main drop-down menus

- Toolbars

- Functionbars (Standard, Radar, and Sonar)

The sections that follow give you details about all drop-down menu hierarchies/submenus and how to access them, as well as how to display the various Toolbars and Functionbars and what they do. All menu levels and functions are illustrated and described, enabling you to work smoothly and efficiently within Navigator.

Main Interface Component Descriptions

This section illustrates the main user interface, and identifies its various components. The interface is composed of standard drop-down and pop-up menus, Toolbars and Functionbars. You simply point-and-click to access most functions, and you can right-click on most any component to display context-sensitive help. Toolbars and Functionbars can be moved around the Navigator screens and charts (by clicking and dragging), and "docked" (positioned) wherever you need them to display. Navigator retains your settings from session to session, and re-displays the interface the same way each time.
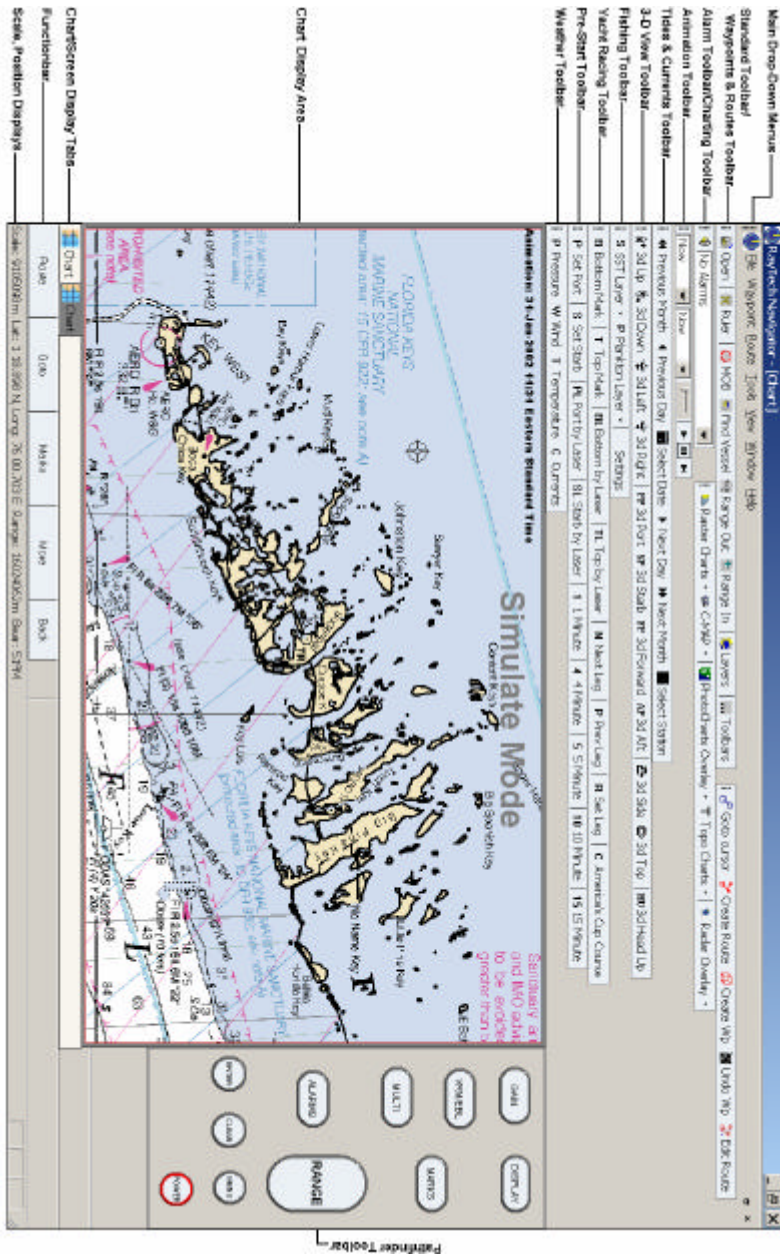
Figure 3-1. Navigator's Main Interface

Drop-Down Menus

This section shows each of the main interface drop-down menus (File, Waypoint, etc. — Figures 3-2 through 3-9) and gives brief functional descriptions of each menu item.

File Menu
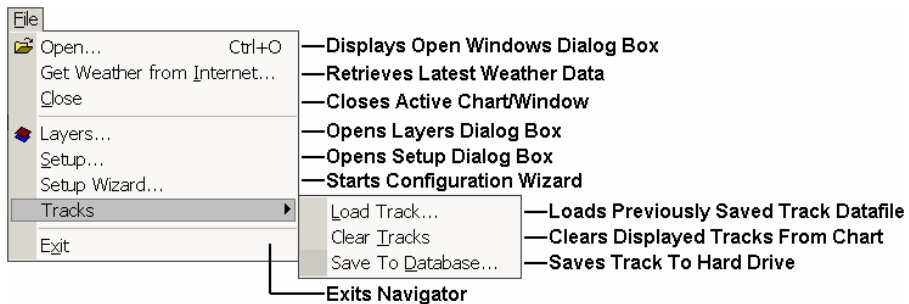
Figure 3-2. File Drop-Down Menu Item Descriptions

Waypoint Menu
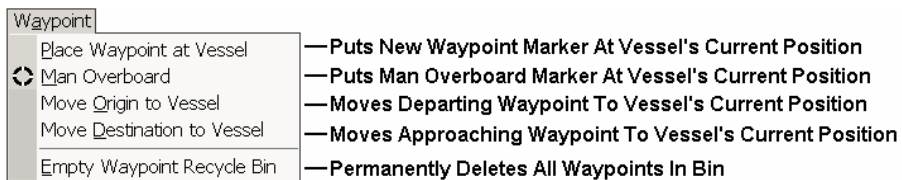
Figure 3-3. Waypoint Drop-Down Menu Item Descriptions

Route Menu

Figure 3-4. Route Drop-Down Menu Item Descriptions

Tools Menu

Figure 3-5. Tools Drop-Down Menu Item Descriptions

Tools/Pre-Start Menu
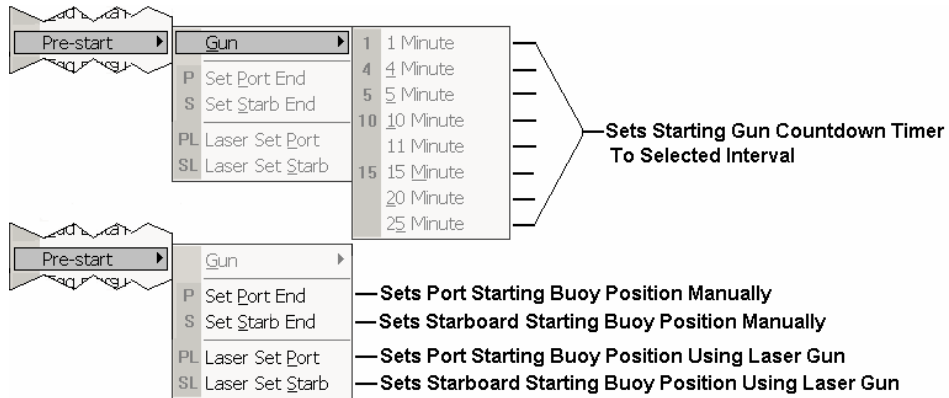
Figure 3-6. Tools/Pre-Start Drop-Down Menu Item Descriptions

View Menu
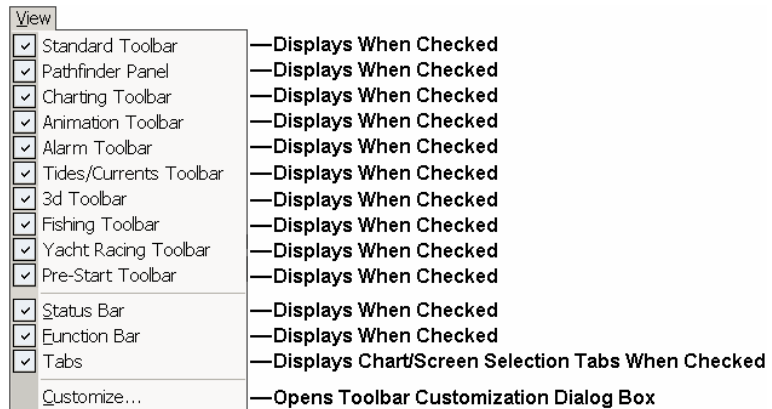
Figure 3-7. View Drop-Down Menu Item Descriptions

Window Menu
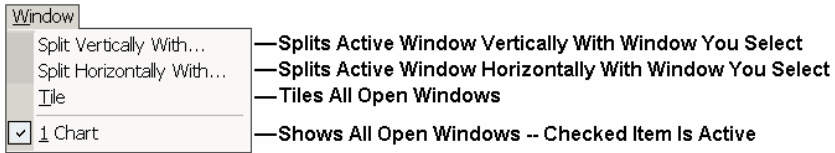
Figure 3-8. Window Drop-Down Menu Item Descriptions

Help Menu
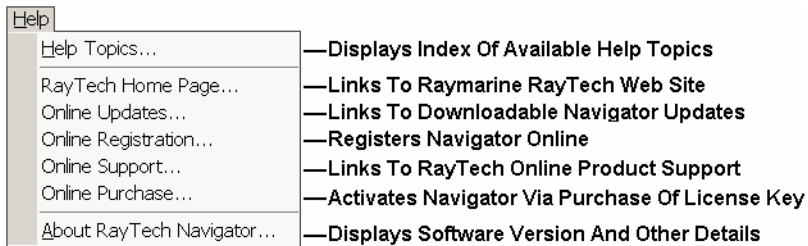
Figure 3-9. Help Drop-Down Menu Item Descriptions

Toolbars

This section shows each of the Toolbars (Standard, Charting, etc. — Figures 3-10 through 3-21) and gives brief functional descriptions of each Toolbar item.

Standard Toolbar
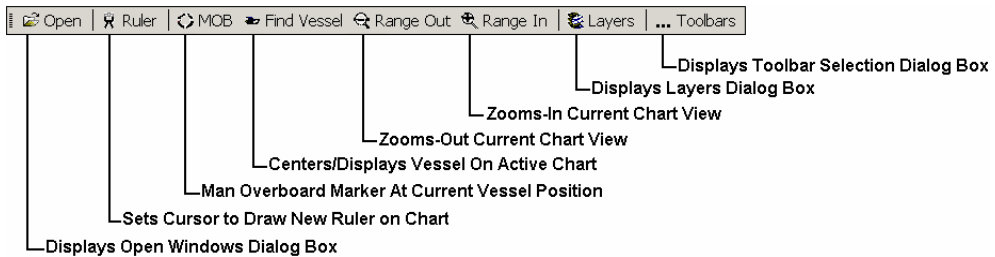
Figure 3-10. Standard Toolbar Item Descriptions

Waypoints and Routes Toolbar
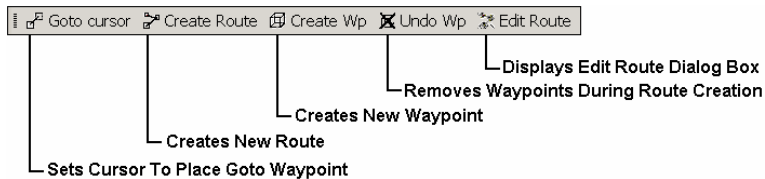
Figure 3-11. Waypoints and Routes Toolbar Item Descriptions

Charting Toolbar
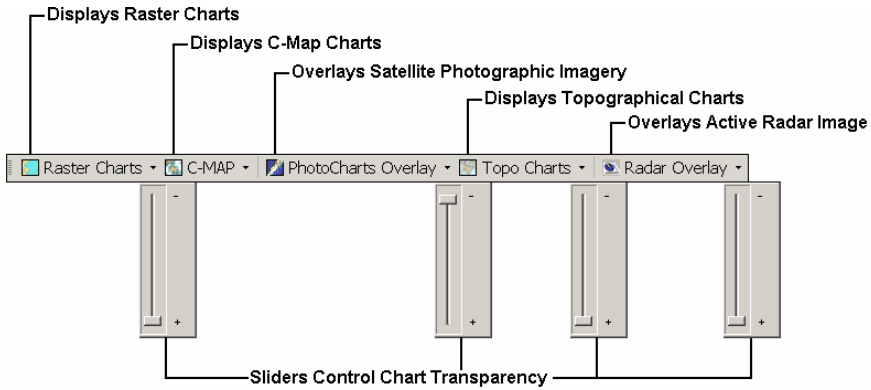
Figure 3-12. Charting Toolbar Item Descriptions

Alarm Toolbar
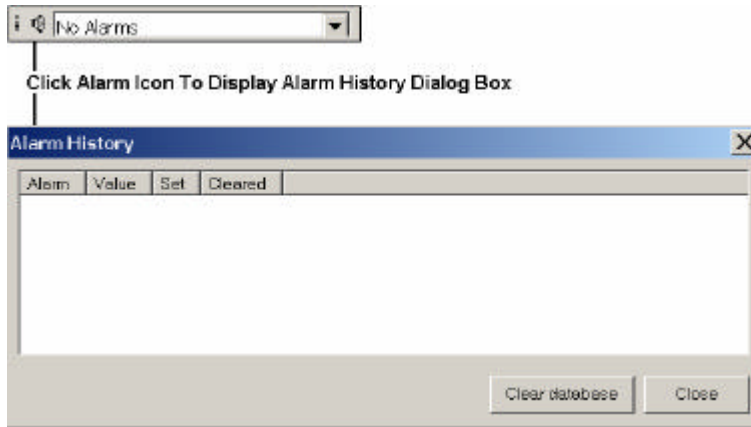
Figure 3-13. Alarm Toolbar Item Descriptions

Animation Toolbar
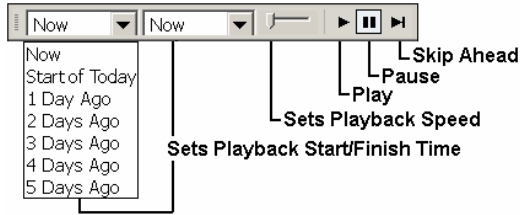
Figure 3-14. Animation Toolbar Item Descriptions

Tides/Currents Toolbar
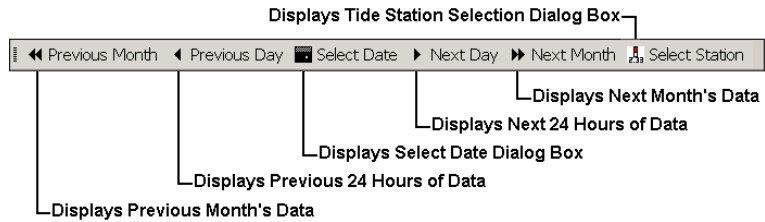
Figure 3-15. Tides/Currents Toolbar Item Descriptions

3-D View Toolbar
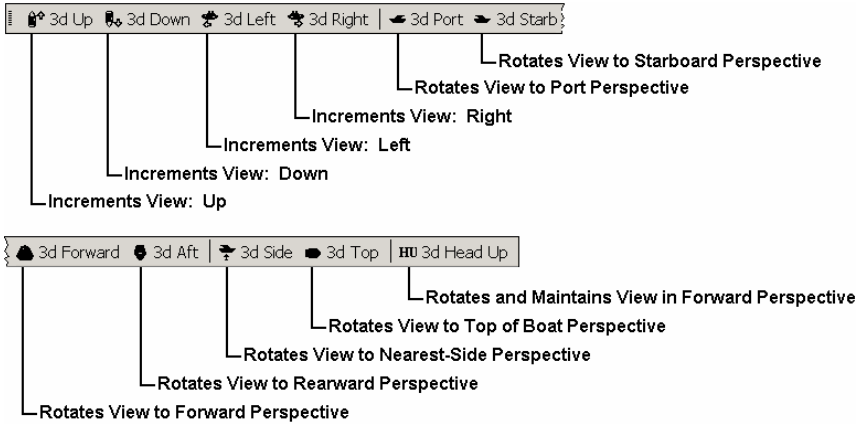
Figure 3-16. 3-D View Toolbar Item Descriptions

Fishing Toolbar
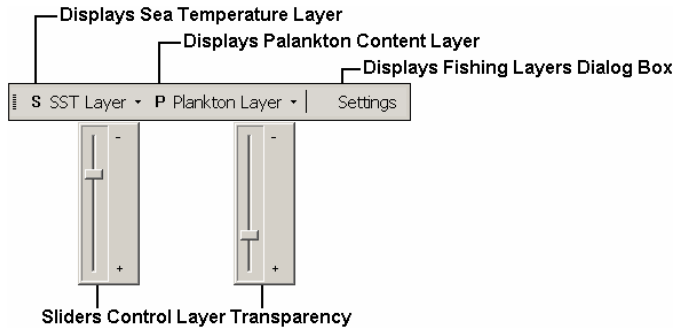
Figure 3-17. Fishing Toolbar Item Descriptions

Yacht Racing Toolbar
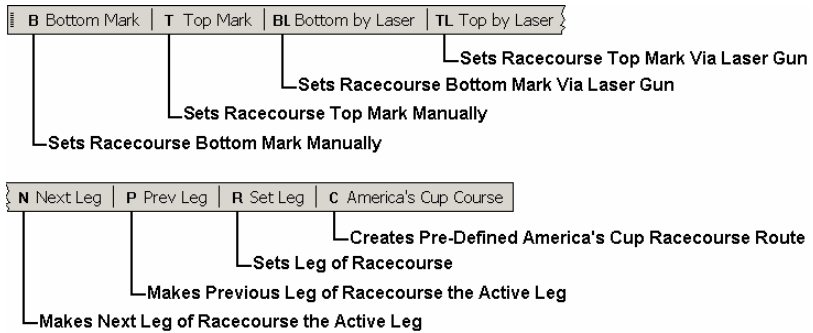
Figure 3-18. Yacht Racing Toolbar Item Descriptions

Pre-Start Toolbar
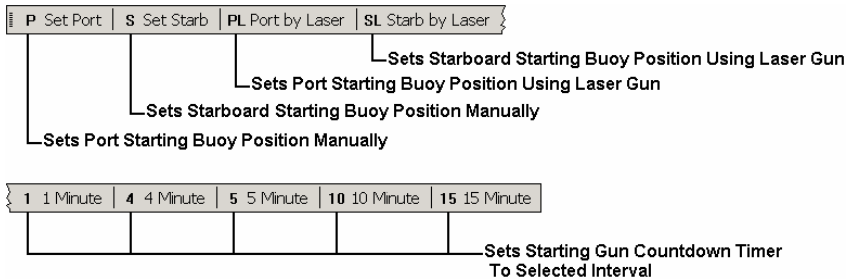
Figure 3-19. Pre-Start Toolbar Item Descriptions

Weather Toolbar
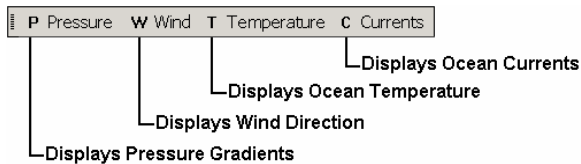
Figure 3-20. Weather Toolbar Item Descriptions

Pathfinder Panel Toolbar
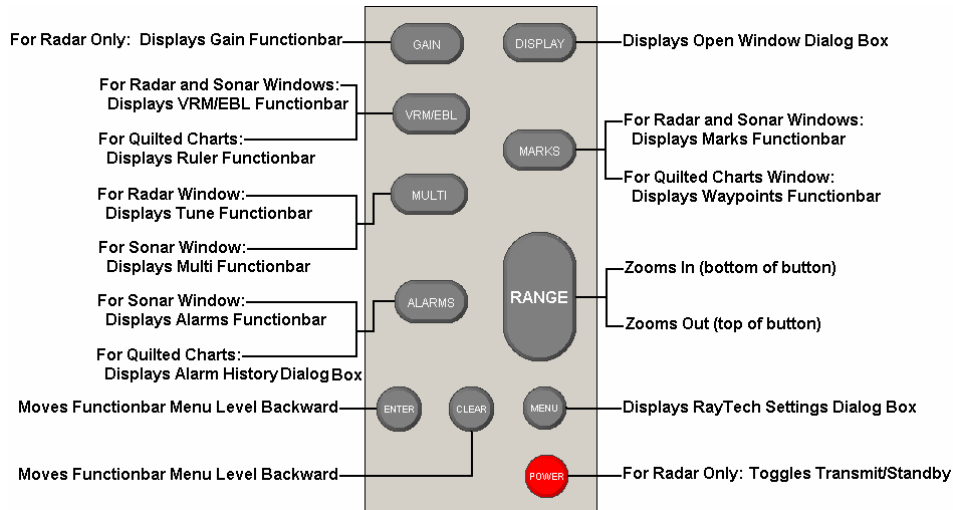
Figure 3-21. Pathfinder Toolbar Item Descriptions

Functionbar Menus

Standard Functionbar

This subsection illustrates the Standard Functionbar's menu hierarchy (Figure 3-22), then gives brief explanations for the function of the buttons on each menu level (Figures 3-23 through 3-30).
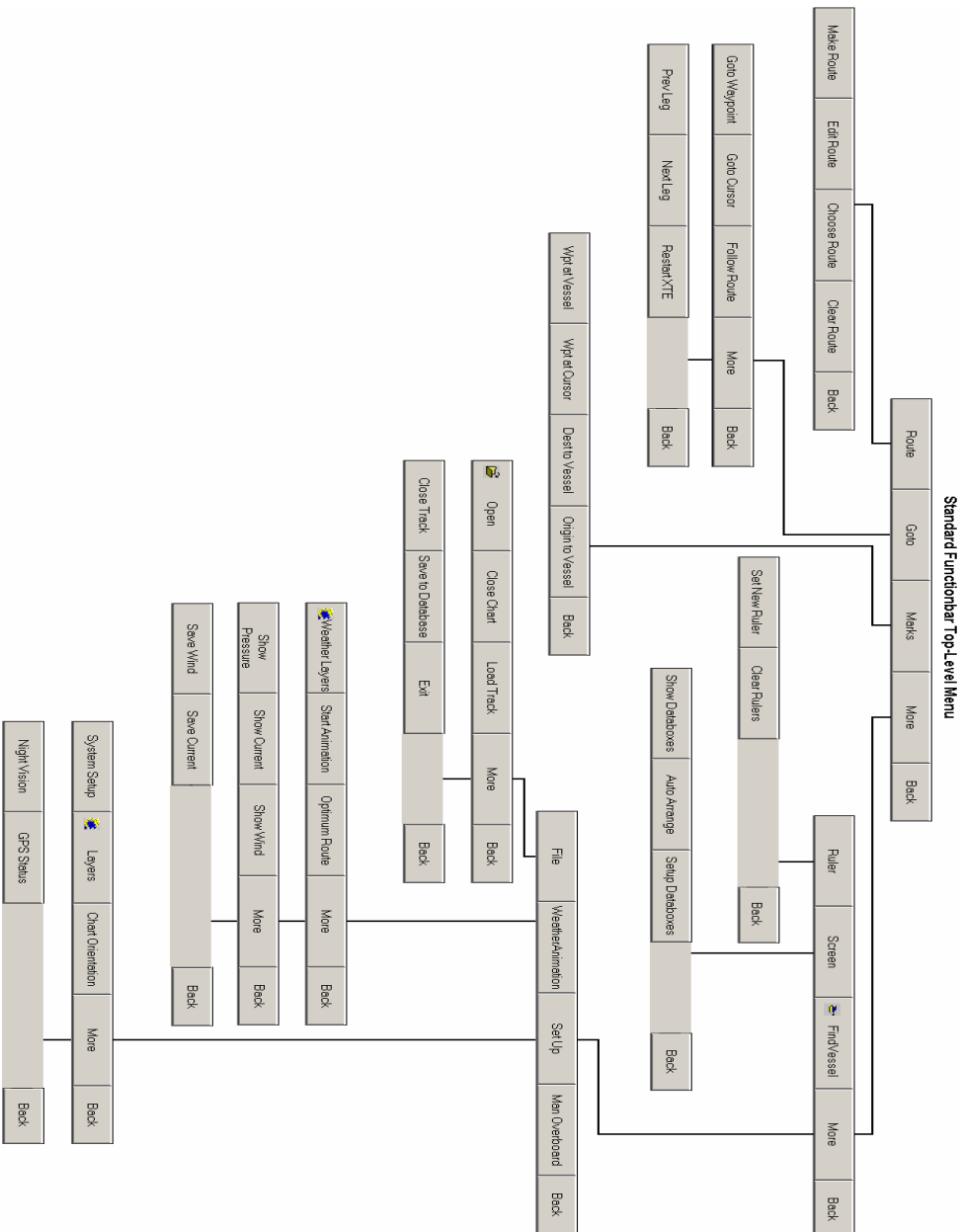
Figure 3-22. Standard Functionbar Menu Hierarchy

Route Button
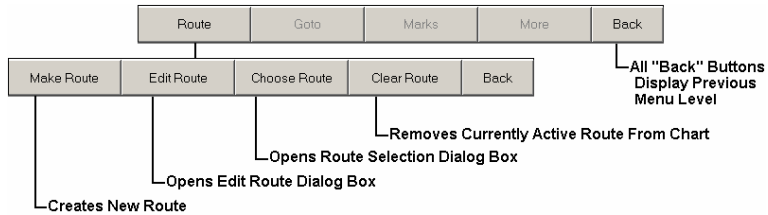
Figure 3-23. Functionbar Route Button Descriptions

Goto Button
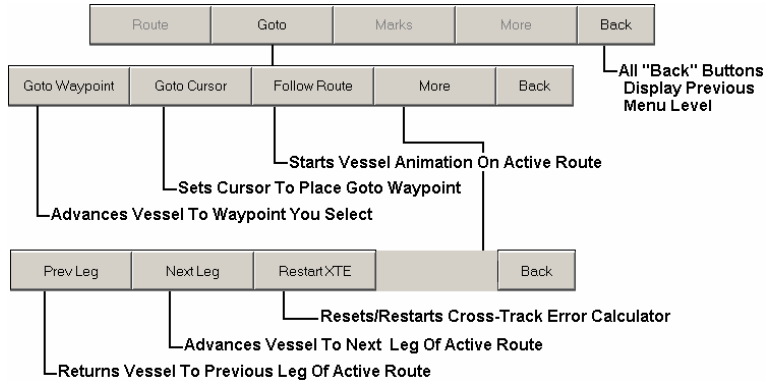
Figure 3-24. Functionbar Goto Button Descriptions

Marks Button
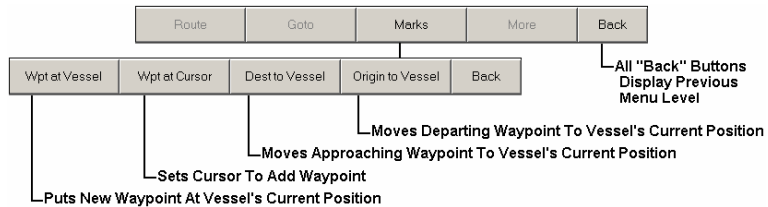
Figure 3-25. Functionbar Marks Button Descriptions

Top-Level "More" Button
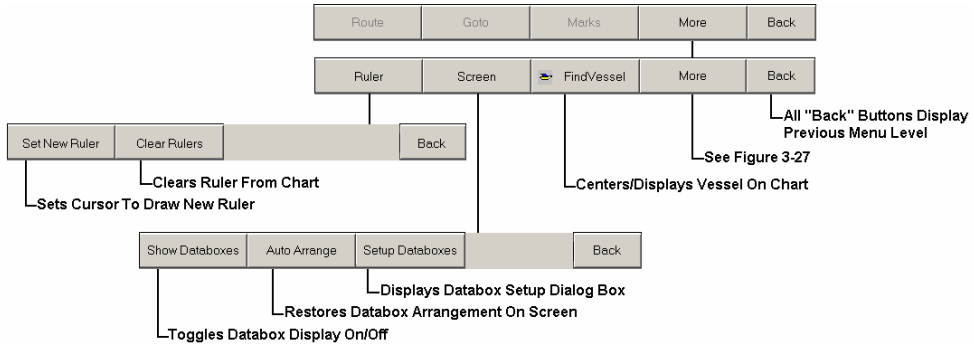
Figure 3-26. Functionbar Top-Level "More" Button Descriptions

Second-Level "More" Button
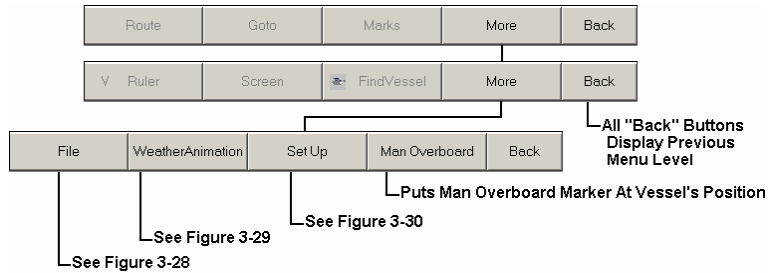
Figure 3-27. Functionbar Second-Level "More" Button Descriptions

File Button
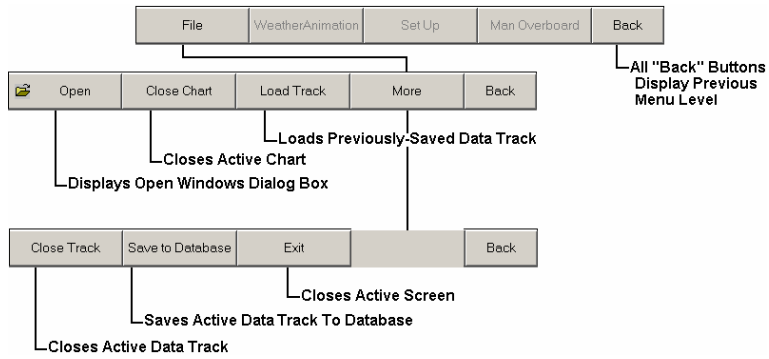
Figure 3-28. Functionbar File Button Descriptions

Weather Animation Button
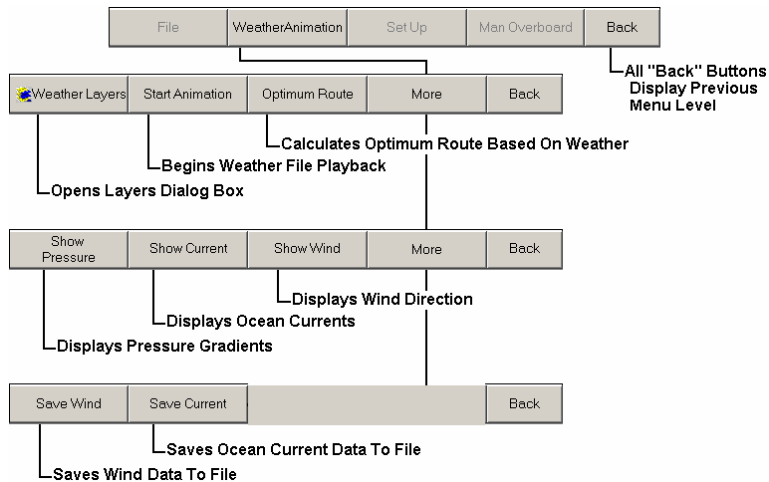
Figure 3-29. Functionbar Weather Animation Button Descriptions

Setup Button
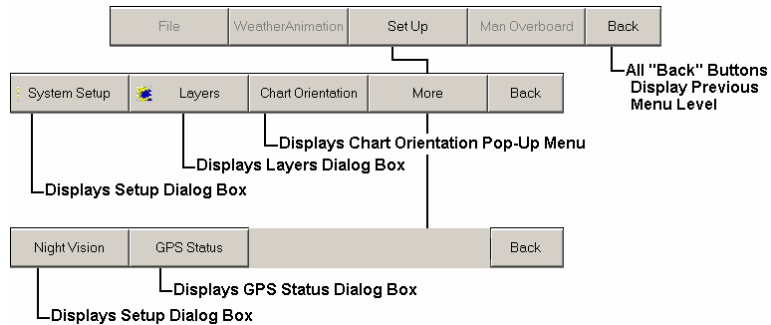
Figure 3-30. Functionbar Setup Button Descriptions

Radar Functionbar

This subsection illustrates the Radar Functionbar's menu hierarchy (Figure 3-31), then gives brief explanations for the function of the buttons on each menu level (Figures 3-32 through 3-37).
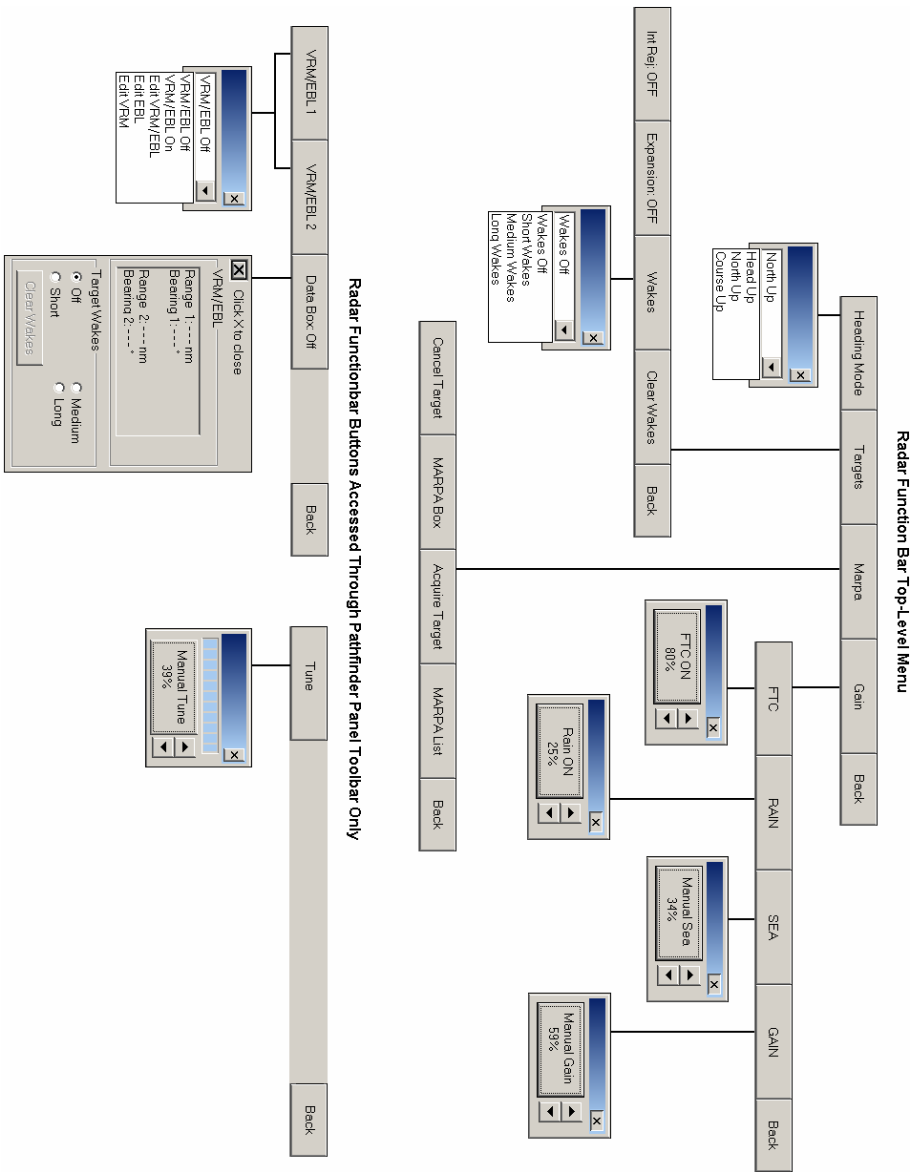
Figure 3-31. Radar Functionbar Menu Hierarchy

Heading Mode Button
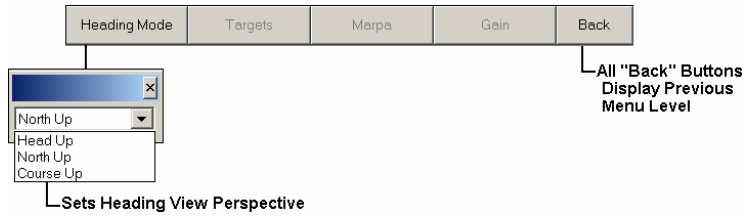
Figure 3-32. Radar Functionbar Heading Mode Button Descriptions

Targets Button
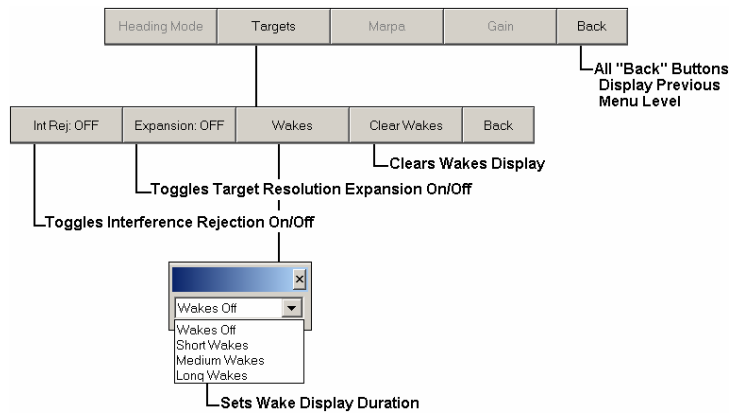
Figure 3-33. Radar Functionbar Targets Button Descriptions

Marpa Button
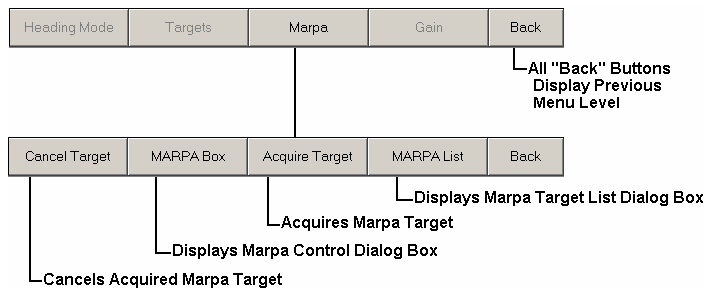
Figure 3-34. Radar Functionbar Marpa Button Descriptions

Gain Button
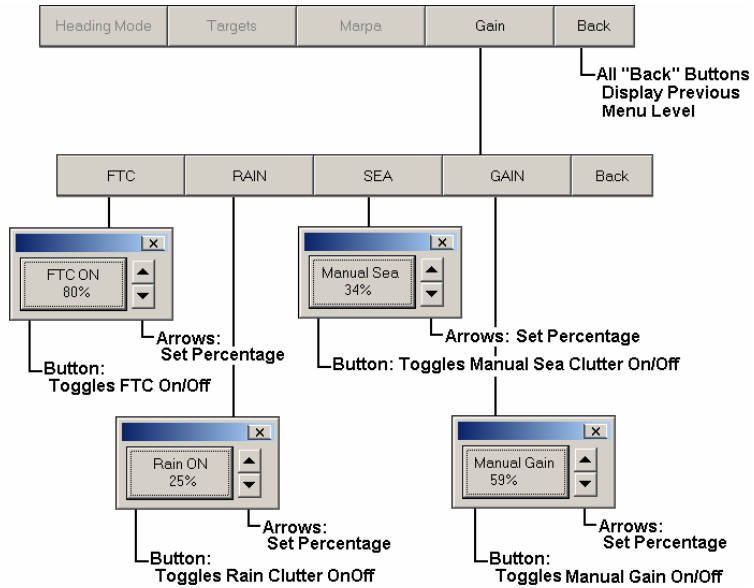
Figure 3-35. Radar Functionbar Gain Button Descriptions

VRM/EBL Buttons

The VRM/EBL Functionbar buttons can only be accessed in an open Radar window by clicking the **VRM/EBL** button on the Pathfinder Panel Toolbar — see Figure 3-21.
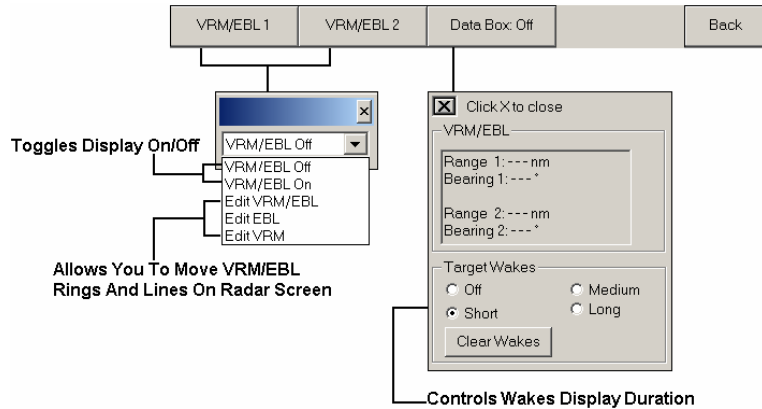
Figure 3-36. Radar Functionbar VRM/EBL Button Descriptions

Tune Button

The Tune Functionbar button can only be accessed in an open Radar window by clicking the **MULTI** button on the Pathfinder Panel Toolbar — see Figure 3-21.
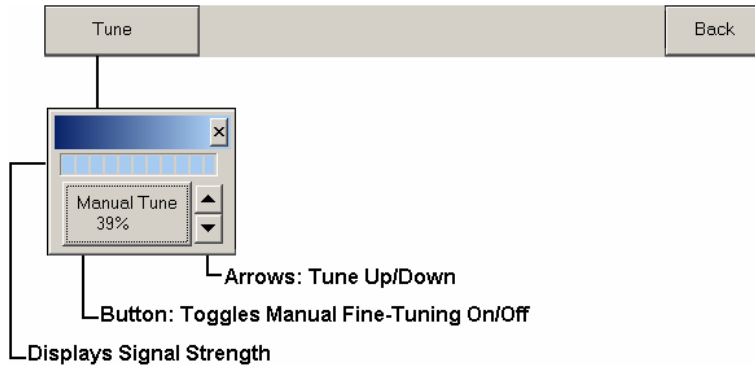
Figure 3-37. Radar Functionbar Tune Button Descriptions

Sonar Functionbar

This section illustrates the Sonar Functionbar's menu hierarchy (Figure 3-38), then gives brief explanations for the function of the buttons on each menu level (Figures 3-39 through 3-44).
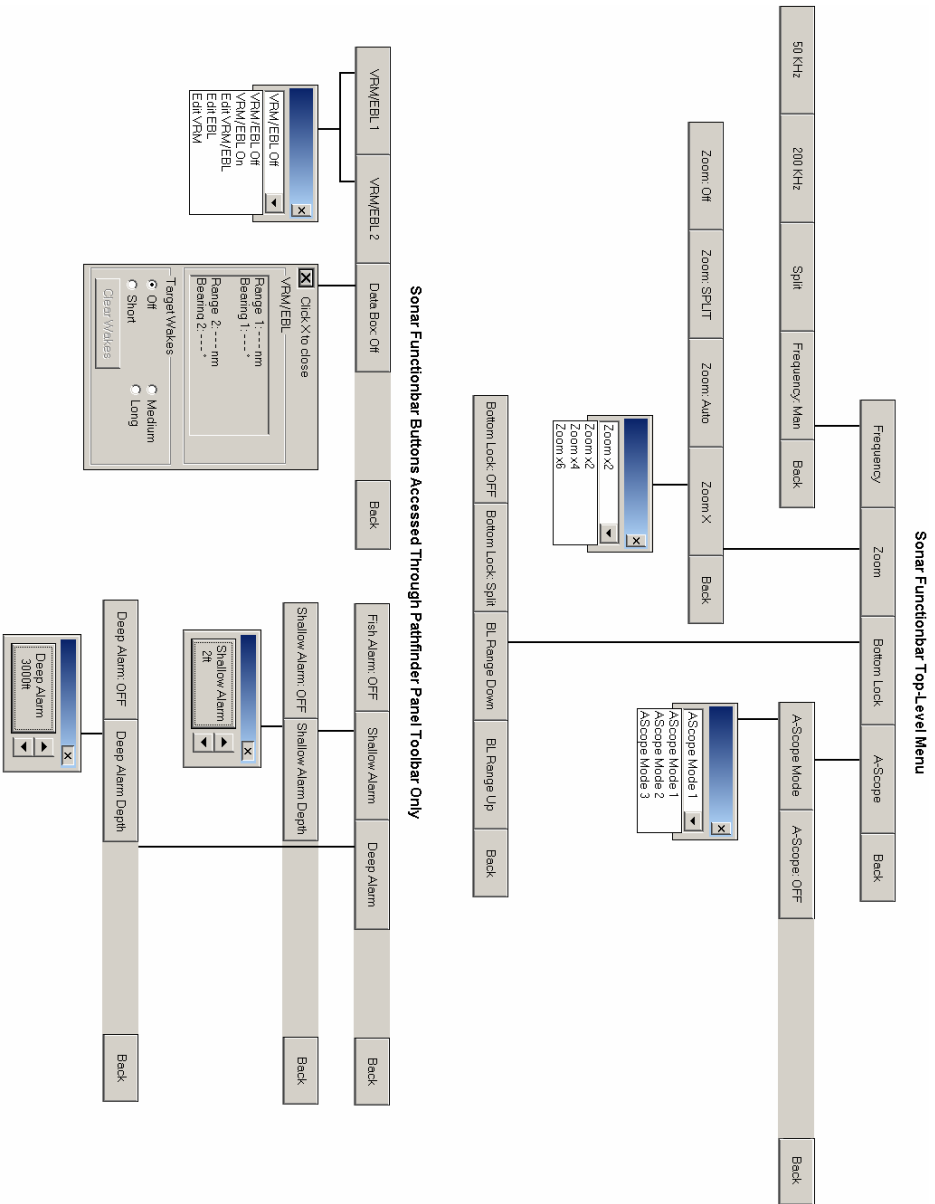
Figure 3-38. Sonar Functionbar Menu Hierarchy

Frequency Button
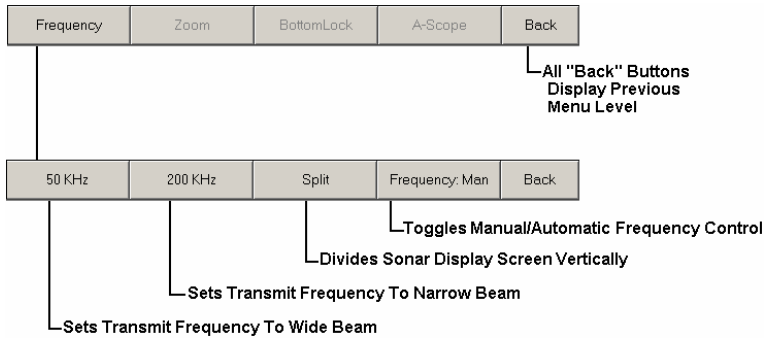
Figure 3-39. Sonar Functionbar Frequency Button Descriptions

Zoom Button
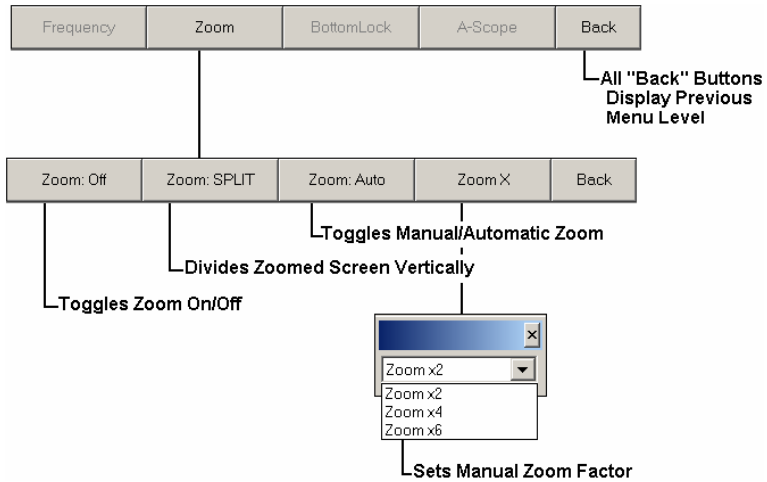
Figure 3-40. Sonar Functionbar Zoom Button Descriptions

Bottom Lock Button
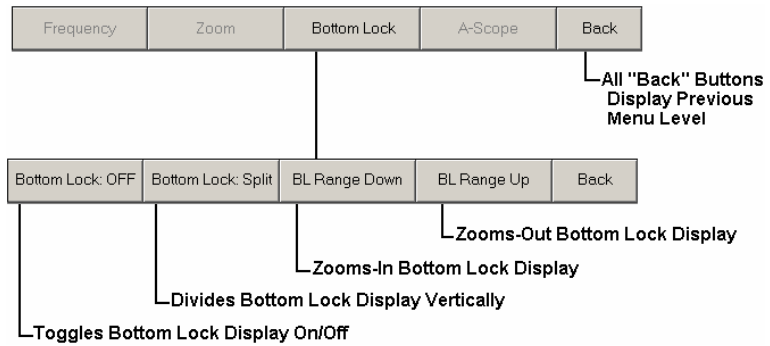
Figure 3-41. Sonar Functionbar Bottom Lock Button Descriptions

A-Scope Button
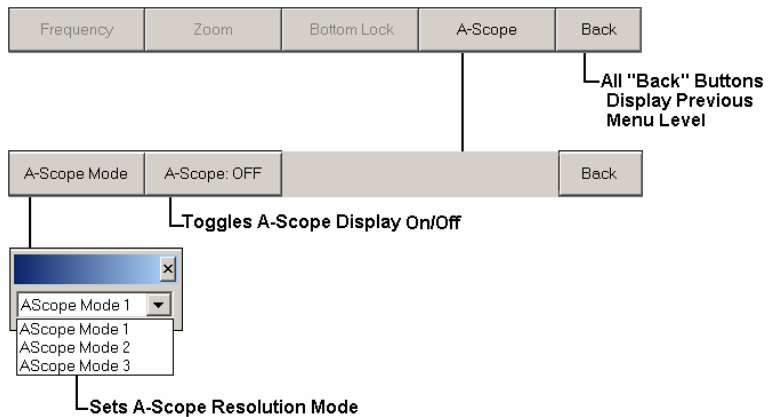
Figure 3-42. Sonar Functionbar A-Scope Button Descriptions

VRM/EBL Buttons

The VRM/EBL Functionbar buttons can only be accessed in an open Sonar window by clicking the **VRM/EBL** button on the Pathfinder Panel Toolbar — see Figure 3-21.
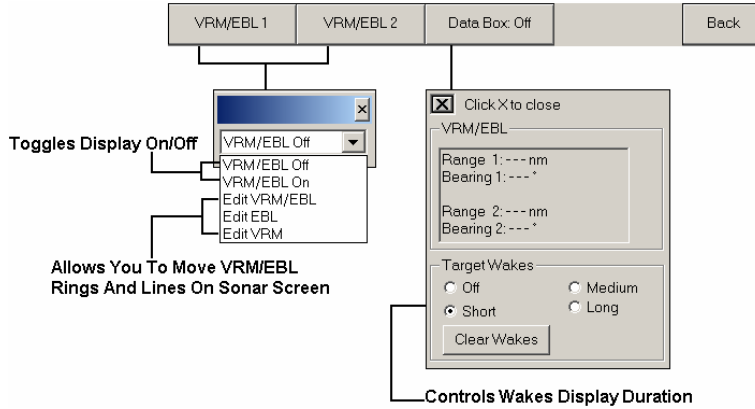
Figure 3-43. Sonar Functionbar VRM/EBL Button Descriptions

Alarm Buttons

The Alarm Functionbar buttons can only be accessed in an open Sonar window by clicking the **ALARMS** button on the Pathfinder Panel Toolbar — see Figure 3-21.
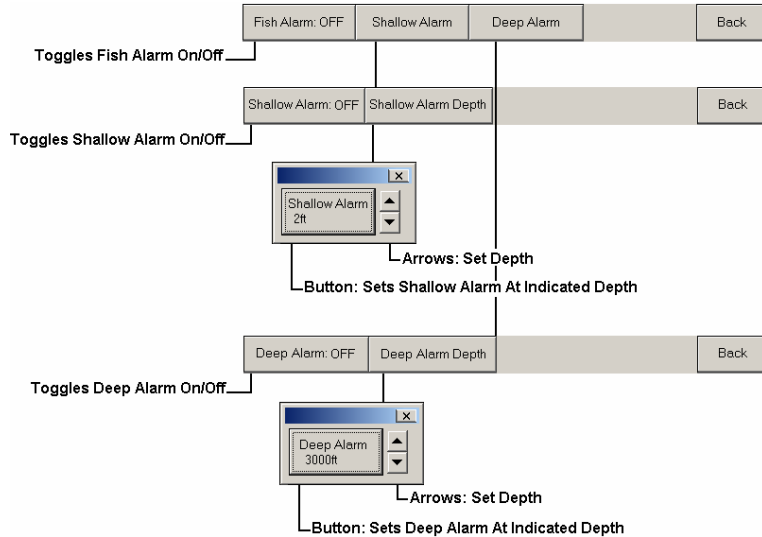
Figure 3-44. Sonar Functionbar Alarm Button Descriptions

Customizing the Interface

This section describes how you can tailor Navigator's interface to display only the information you require. It explains how use the Customize dialog box to modify and personalize the following areas of Navigator:

- Drop-down menu commands

- Toolbars

- Keyboard input

- Toolbar and Menu display appearance

- Toolbar and Menu display behavior

Using the Customize Dialog Box

This subsection illustrates the Customize dialog box and also shows and explains how to use its various tabs (Figures 3-45 through 3-49). Each tab displays a different set of options and parameters, enabling you to alter the appearance and behavior of many parts of Navigator's interface to better suit your needs.

Commands Tab

The Commands tab of the Customize dialog box enables you to
customize Navigator's drop-down menus to display the commands
you want to see, rather than the defaults.

To customize drop-down menus:

1. From the View menu (or right-click near the Toolbar display
    area), select **Customize** to display the Customize dialog box
    (Figure 3-45).

2. In the **Categories** window, select the drop-down menu that
    contains the command you want to move to another drop-
    down menu. The available commands for that menu are
    displayed in the **Commands** window.

3. Highlight the command you want to add, then drag it over
    to the name of the drop-down menu you want to add it to.
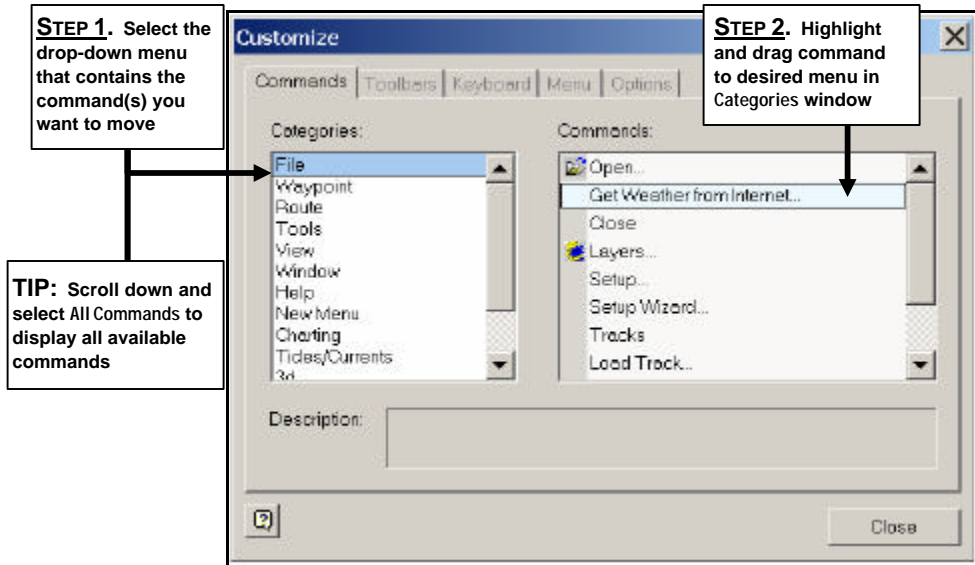
Figure 3-45. Customize Dialog Box Commands Tab

Toolbars Tab

The Toolbars tab of the Customize dialog box enables you to restore Navigator's Toolbars to their factory default states, and also allows you to create and name (and rename) custom Toolbars.

To display the Toolbars tab:

1. From the View menu (or right-click near the Toolbar display area), select **Customize** to display the Customize dialog box.

2. Click the **Toolbars** tab (Figure 3-46).

To reset Toolbars to original default settings:

1. Check the box(es) beside the Toolbar(s) you want to reset

2. Click **Reset**; or if you want to reset all the Toolbars at once, click **Reset All**.

To create and name a custom Toolbar:

1. Click **New**. The Toolbar Name dialog box is displayed (Figure 3-46).

2. Type the name you want for the Toolbar (up to 50 characters) then click **OK**. The new Toolbar appears in the Toolbar window and also appears on the screen.

To rename a custom Toolbar:
(Only Toolbars that you have created can be renamed or deleted.)

1. Click **Rename**. The Toolbar Name dialog box is displayed (Figure 3-46).

2. Type the new name you want for the Toolbar (up to 50 characters) then click **OK**. The new Toolbar appears in the Toolbar window and also appears on the screen.
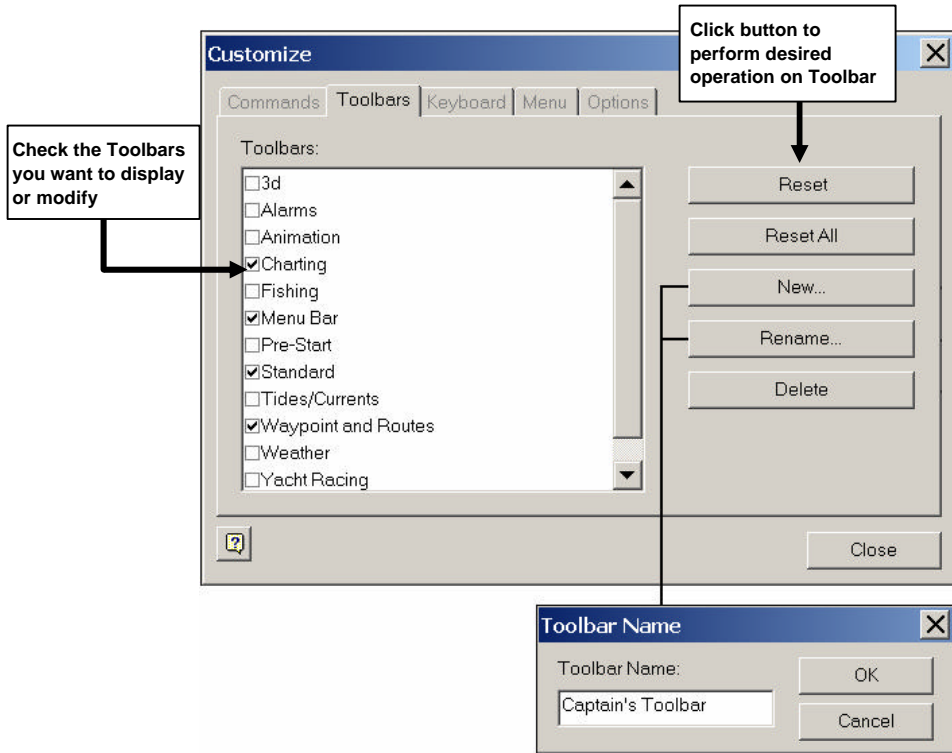
Figure 3-46. Customize Dialog Box Toolbars Tab

Keyboard Tab

The Keyboard tab of the Customize dialog box enables you to associate keystroke shortcuts to commonly-used commands in Navigator. For example, to display the Layers dialog box, you might assign the keys **Ctrl+L**. Then, each time you press that sequence of keys, the Layers dialog box appears.

To associate keystrokes with commands:

1. From the View menu (or right-click near the Toolbar display area), select **Customize** to display the Customize dialog box.

2. Click the **Keyboard** tab (Figure 3-47).

3. From the **Category** drop-down menu, select the menu that contains the command you want to create a shortcut for.

4. In the **Press New Shortcut Key** window, type the key sequence you want to represent the command.

5. Click **Assign** to complete creating the shortcut.

STEP 1. Select the drop-down menu that contains the command you want

STEP 4. Click Assign

TIP: Scroll down and select *All Commands* to display all commands

STEP 2. Highlight the command you want to shortcut

STEP 3. Type key sequence
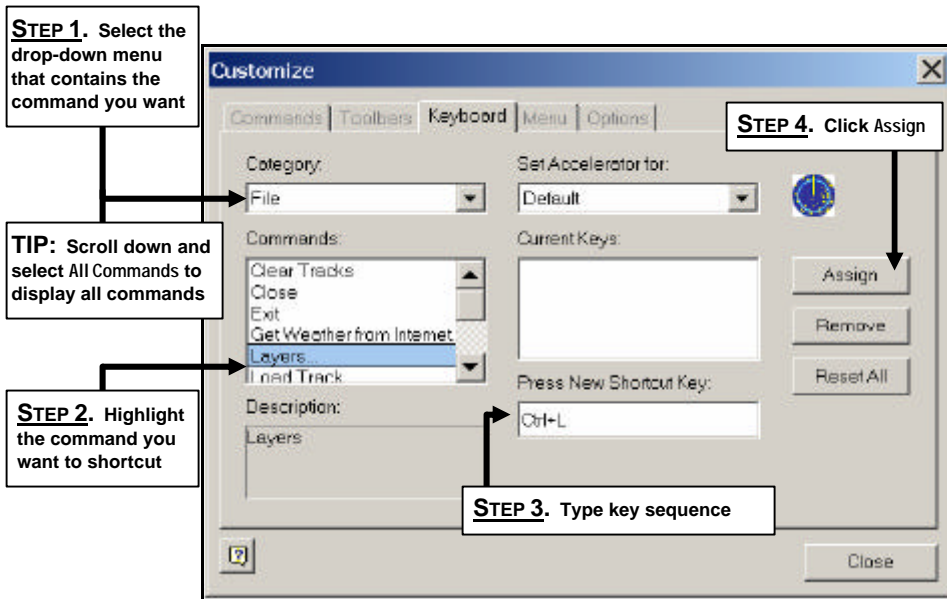
Figure 3-47. Customize Dialog Box Keyboard Tab

Menu Tab

The Menu tab of the Customize dialog box is currently non-functional within Navigator; however, it will display if the tab is clicked.
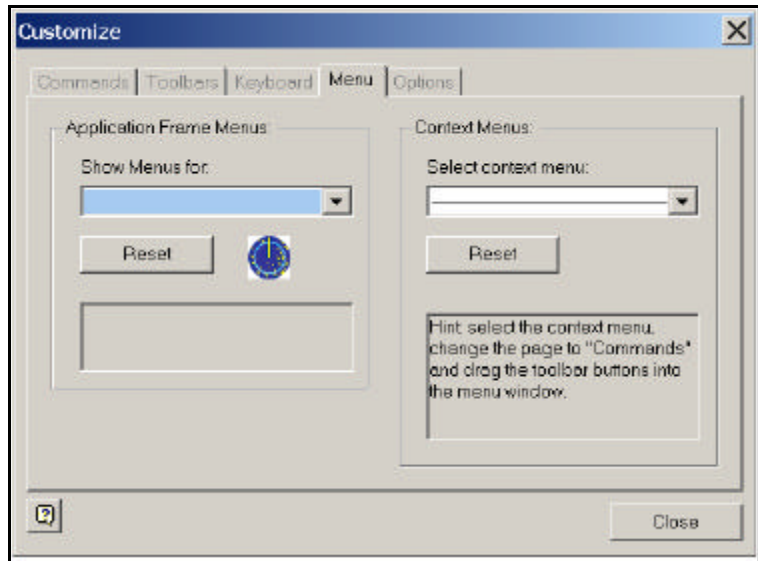
Figure 3-48. Customize Dialog Box Menu Tab

Options Tab

The Options tab of the Customize dialog box contains checkboxes that control Toolbar and icon display characteristics. You can also download a new appearance profile for the interface that changes the "look and feel" of the controls without affecting their behavior or command structures.

To display the Options tab:

1. From the View menu (or right-click near the Toolbar display area), select **Customize** to display the Customize dialog box.

2. Click the **Options** tab (Figure 3-49).

3. Check the items you want displayed, or to change the "look and feel" of Navigator's interface, click Visualizations and follow the instructions given. Figure 3-49 shows an example of a "before" and "after" Toolbar.
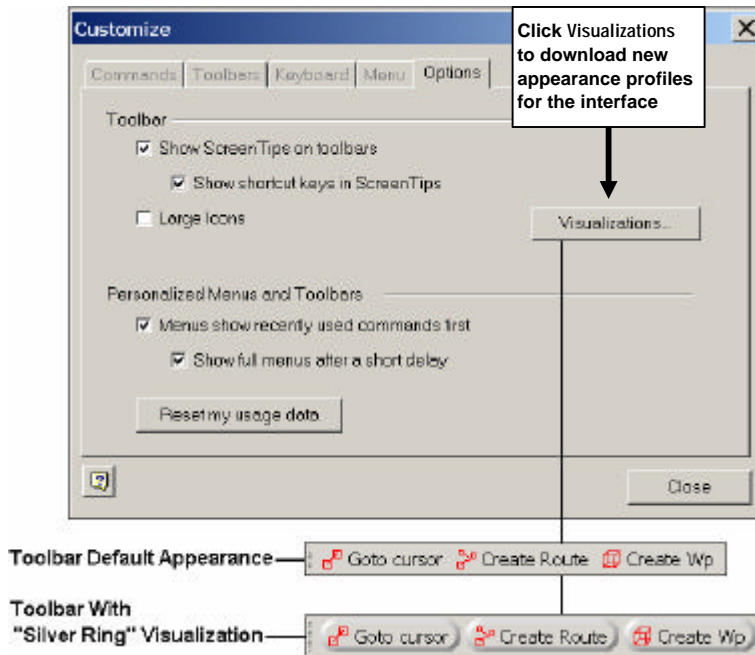
Figure 3-49. Customize Dialog Box Options Tab

Chapter 4
Working With Charts And Routes

Overview

This chapter explains how to use RayTech Navigator to chart and plot courses for nautical navigation. The chapter is intended to have you navigating with the basics in the shortest possible time, and leaves the more complex Navigator operations for Chapter 5, "*Advanced Navigator Functions*." Refer to that chapter if you already have a working knowledge of Navigator. This chapter covers the following areas:

- Installing, displaying, and manipulating the various chart types

- Creating, editing, and implementing waypoints and routes

- Getting and using the latest weather and oceanographic reports

Installing Charts

This section explains how to install and load the various chart types that Navigator uses.

About Using Charts with Navigator

Navigator supports all of the popular chart types, including:

- C-Map NT
- Maptech NOAA/BSB
- Maptech PCX
- Maptech Photo Regions and Topographical Charts
- SoftCharts Nautical Charts and PhotoNavigator

Important: Navigator automatically loads a default World Chart on each start-up. You cannot close this window or uninstall this chart — simply open a new window over it.

Working with charts in Navigator consists initially of installing the charts, after which, you can open and display as many or as few as you need. The more charts you decide to install, the longer the overall installation process takes; however, once installed, you can display those charts at the moment you need them without waiting.

> It's important to keep in mind the difference between installing the charts <u>into Navigator</u>, and installing the charts <u>onto your PC</u> from the original manufacturer's CD. The chart installation instructions in this chapter describe installation from a Navigator point-of-view, leaving the explanation of installing the charts onto your PC to the chart manufacturer. Refer to the instructions that came with the CD.

Where to Store Charts

The best place to store your charts is on the hard drive of the PC that's running Navigator. By loading your most commonly used charts onto the PC, you always have virtually instant access to them, they load faster, and they are easier to read under rough conditions (CD drives can skip tracks if tossed about). The charts, especially photographic charts, will consume disk space, but with today's large-Gigabyte hard drives, it should not be an issue.

Installing MapTech PCX and NOAA/BSB Charts

To install MapTech PCX and NOAA/BSB Charts:

1. Insert the chart CD into the PC.

2. From the **File** menu, select **Settings**. The RayTech Settings dialog box (Figure 4-1) is displayed.

3. Double-click on the Raster Charts icon. Chart Manager screen 1 is displayed (Figure 4-2).

Double-click Raster Charts icon to begin installing charts
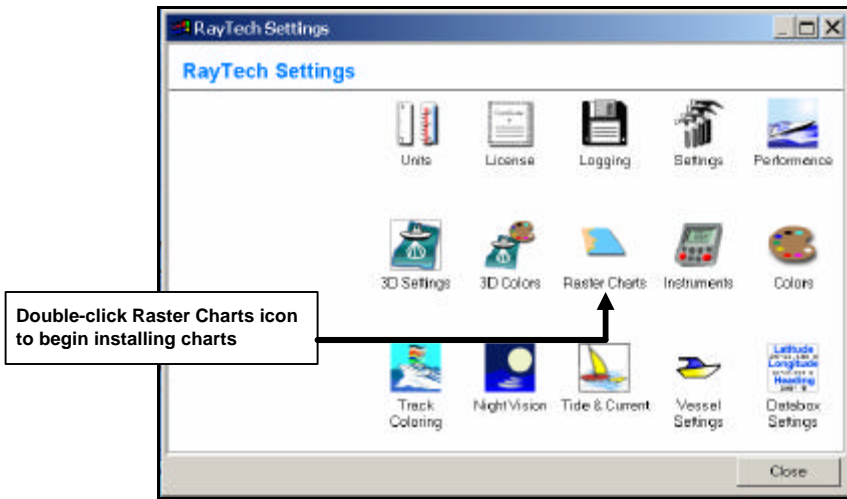
Figure 4-1. RayTech Settings Dialog Box
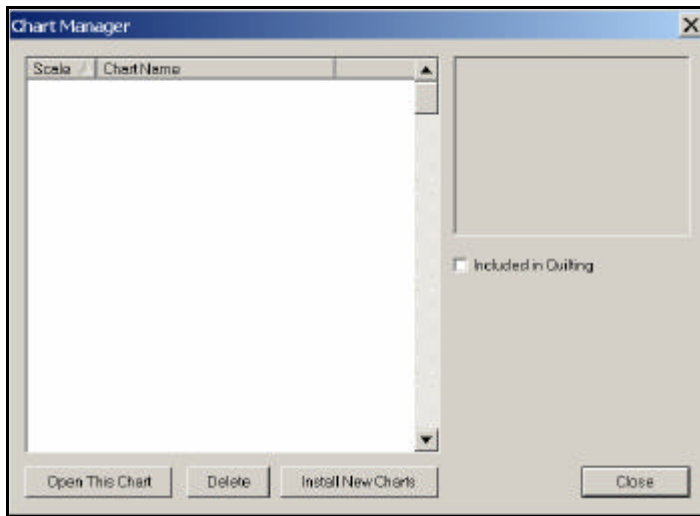
Figure 4-2. Chart Manager Screen 1

The Chart Manager displays all currently available raster charts (although it will be initially empty), and is the starting place for opening installed charts or installing new charts.

4. Click **Install New Charts**. Chart Installer screen 1 is displayed (Figure 4-3).
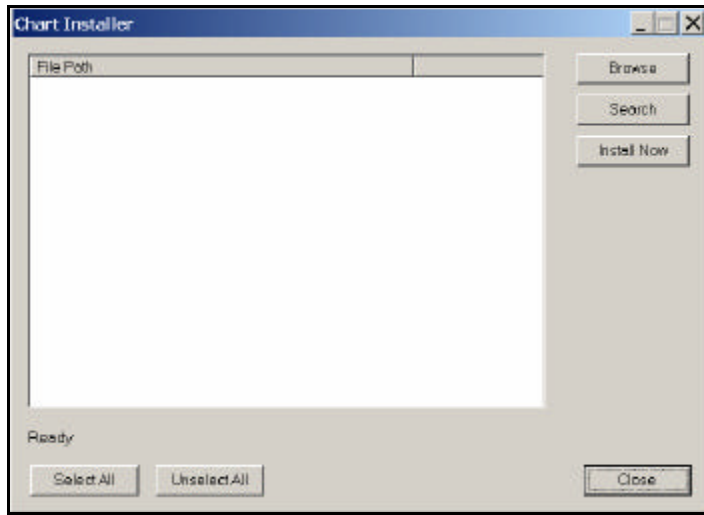
Figure 4-3. Chart Installer Screen 1

5. If you know where the charts you want to load are, click **Browse** and locate/select the appropriate directory. If you want Navigator to search all available drives for charts, click **Search**. After a few moments, Navigator displays all charts available for installation (Figure 4-4).
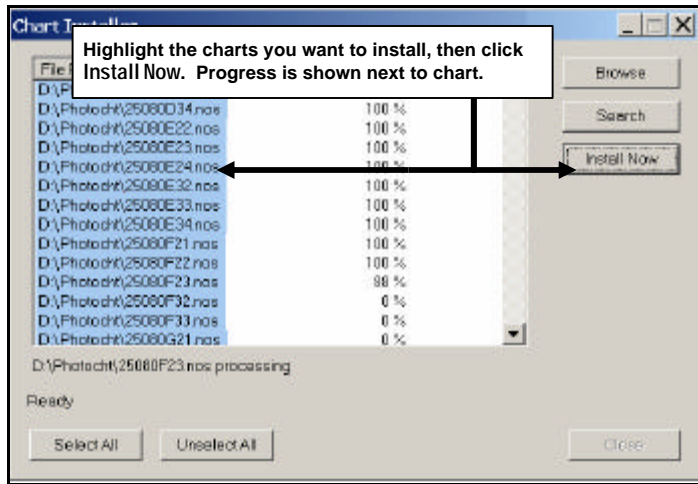
Figure 4-4. Chart Installer Screen 2

6. Highlight the charts you want to install (or click **Select All** to install every chart), then click **Install Now**. The progress of each chart's installation is shown. When the charts have been installed, Chart Manager screen 1 is redisplayed (Figure 4-5).
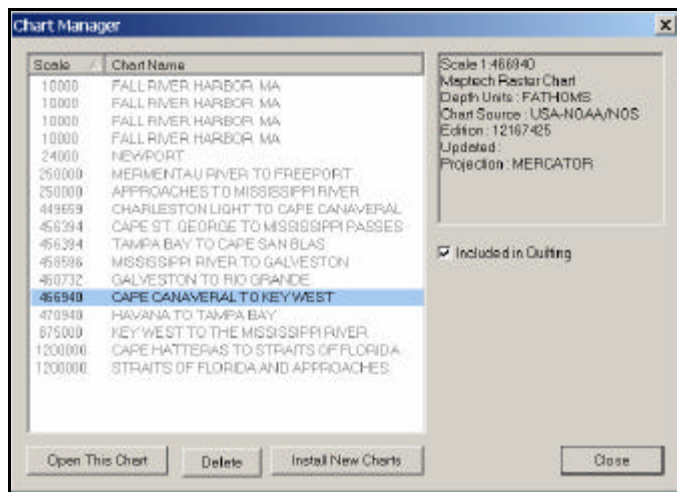
Figure 4-5. Chart Manager Screen 1 Showing Installed Charts

Working With Routes

This section explains how to plot and edit routes. A route is a path from location A to location B, and is composed of a series of waypoints that you "place" on a displayed chart. Each waypoint represents a certain position along the path of the route. A route typically has a starting waypoint, an ending waypoint, and as many intermediate waypoints as you need or want.

The distance between any two waypoints is known as a leg. The leg of the route your boat is currently traversing is called the active leg. An active leg consists of an origin waypoint (the waypoint you just departed) and a destination waypoint (the waypoint you are moving toward). In Navigator, the active leg of a route is represented by a dashed line and a blinking gray circle around the destination waypoint.

Plotting a route requires just a few mouse clicks, and you can easily move/adjust your waypoints after placing them on the screen. Routes can be as simple or complex as you need, and by offering a wide range of icons and display colors, Navigator allows you to customize each route (*and* individual waypoints) for easy recognition and navigation. Navigator stores all your favorite or most commonly used routes, and you can create several backup routes for any destination, should inclement weather or other circumstances dictate you take a different course. If you have Navigator connected to a GPS and Autopilot, the route you chart on the screen can be run automatically.

Note: *The subsections that follow presume that you already have charts installed <u>and displayed</u> within Navigator.*

Creating a Route

To create and name a route:

1. As shown in Figure 4-6, select **Create Route** from the
    Route menu, or, click the **Create Route** button on the toolbar.
    The Quick Route dialog box is displayed (Figure 4-7).
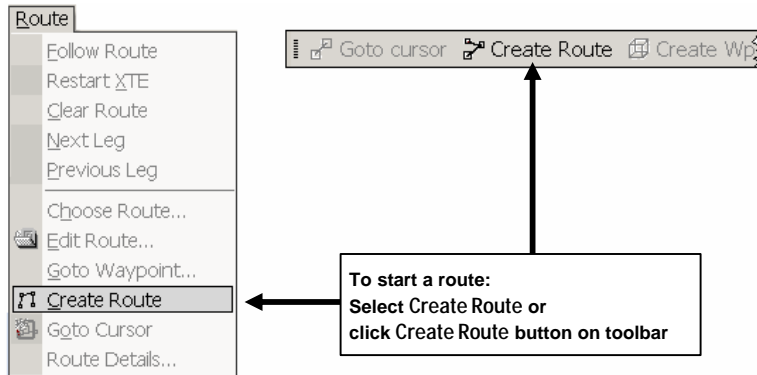
Figure 4-6. Two Ways of Starting a Route
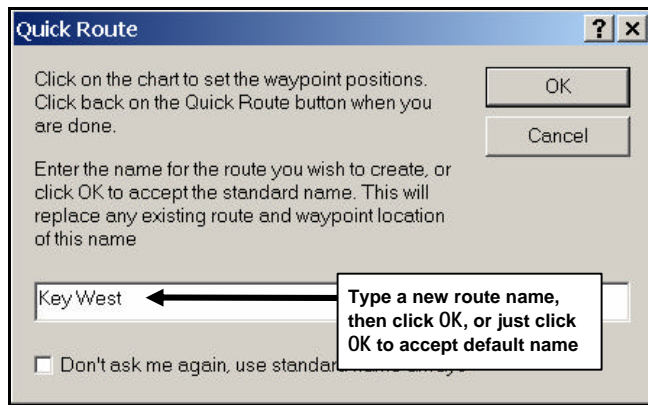
Figure 4-7. Quick Route Dialog Box

2. Type in a name (up to 13 characters including blanks) for your route, or click **OK** to accept the default name of "Qr."

Note: Identical route names will ov*e*rwrite each other
         without a confirmation warning.

3. Click **OK**. The Standard cursor ⊕ changes to the Route cursor ⊕ (Figure 4-8). Move the cursor over the area where you want the route to begin, then left-click the mouse. The route is started, and the name you chose along with range and bearing of the first leg is displayed (Figure 4-8).
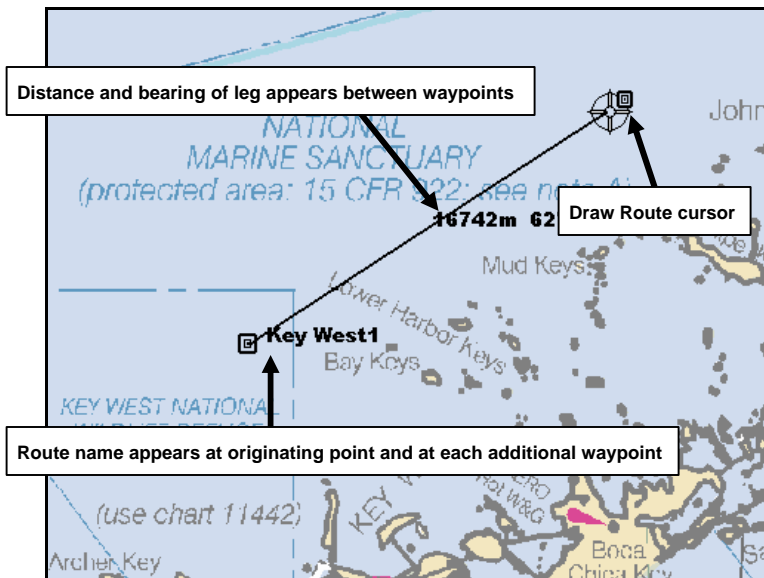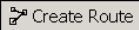
Figure 4-8. Beginning a Route

4.   Draw the route you want to take. Left-click at the places where you want to leave a waypoint marker. To remove waypoints, click the **Undo Wp** button ⬚ Undo Wp on the toolbar.

The route name along with the range and bearing of each leg is displayed between each waypoint (Figure 4-9).

5.   As shown in Figure 4-9, when you reach the end of the route, right-click and select **Finish Quick Route,** or just click the **Create Route** button ⬚ Create Route on the toolbar.

Figure 4-9. **Completing a Route**

Editing Routes and Waypoints

After you've completed plotting a route, you might want to make some changes. Navigator allows you to fully manage your routes and their waypoints, including moving/removing waypoints and routes, working with groups of waypoints, and changing waypoint properties (properties govern how a waypoint appears and behaves on the screen). Editing routes and waypoints covers the following topics:

- Adding, moving, and deleting waypoints
- Modifying waypoint display characteristics
- What are, and how to place, relative waypoints
- Creating and editing waypoint groups
- Using the waypoint recycle bin
- Adding, moving, renaming, and deleting routes

Waypoint Basics: Adding, Moving, and Deleting

This subsection describes how to add waypoints to an existing route, move/relocate waypoints on the chart, and delete waypoints.

To add a waypoint to a route:

1. As shown in Figure 4-10, select **Edit Route** from
    Route menu or click the **Edit Route** on the toolbar.
    The Edit Route dialog box is displayed (Figure 4-11).
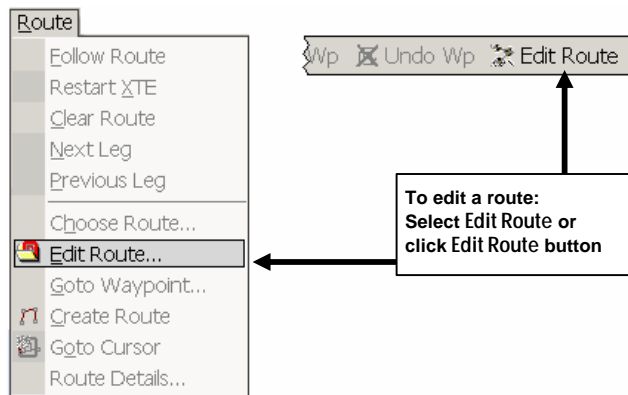
Figure 4-10. Two Ways of Displaying the Edit Route Dialog Box
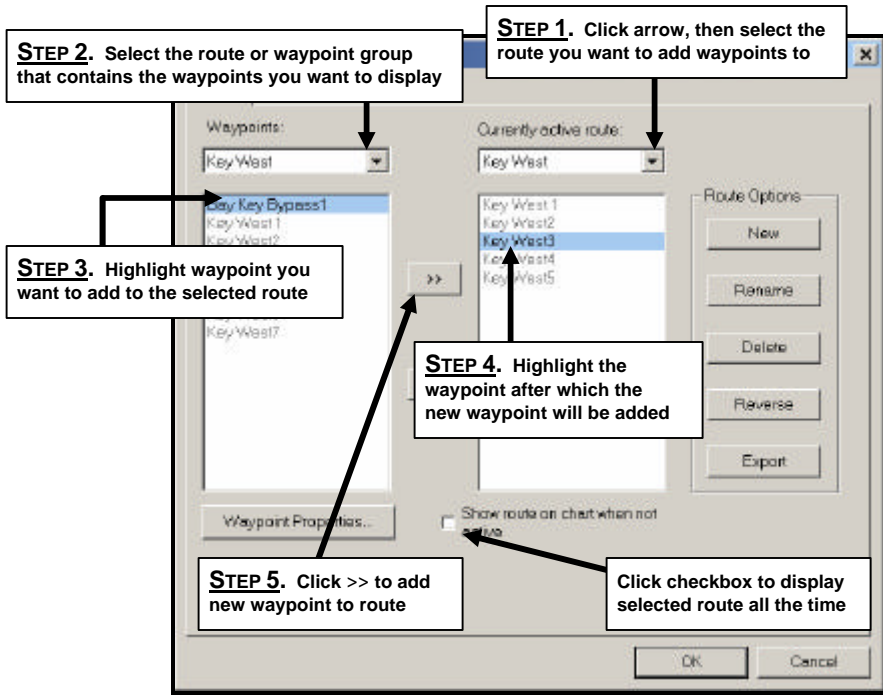
Figure 4-11. Edit Route Dialog Box: Adding a Waypoint to a Route

If the route you want to add waypoints to is not the currently active route, you'll need to select it as shown in Figure 4-11. The waypoints associated with the currently selected route are displayed in the window directly beneath **Currently active route**.

2. As shown in Figure 4-11, click the arrow beneath **Waypoints** to display the waypoint group drop-down menu. Select the waypoint group that contains the waypoint(s) you want to add to the selected route.

3. Highlight the waypoint you want to add.

4. Under **Currently active route**, highlight the waypoint after which you want the new waypoint added.

5. Click **>>** to add the new waypoint to the selected route.

To move (relocate) a waypoint:

1. As shown in Figure 4-12, place the cursor over the waypoint you want to move, then press and hold the left mouse button.

2. Move the cursor to the position on the chart where you want the waypoint moved, then release the button. The waypoint moves to the new location.
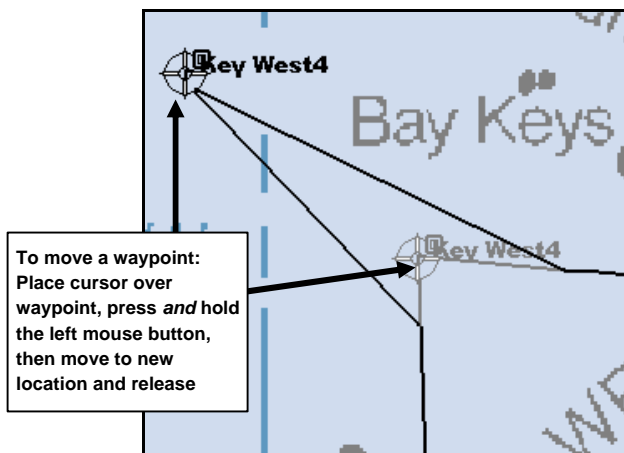
Figure 4-12. Moving a Waypoint

To move the waypoint you're <u>heading toward</u> to your vessel's current position:

1. As shown in Figure 4-13, select **Move Destination to Vessel** from the Waypoint menu, or, click **Marks/Dest to Vessel** on the function bar.

    The waypoint you are approaching is moved to your vessel's current location.
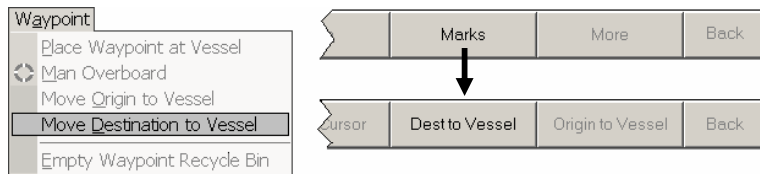
Figure 4-13. Moving the Waypoint You Are Approaching To The Vessel

To move the waypoint you're <u>heading away from</u> to your vessel's current position:

1. As shown in Figure 4-14, select **Move Origin to Vessel** from the Waypoint menu, or, click **Marks/Origin to Vessel** on the function bar.

    The waypoint you are heading away from is moved to your vessel's current location.

Figure 4-14. Moving the Waypoint You Are Leaving To The Vessel

To put a new waypoint at your vessel's current position:

1. As shown in Figure 4-15, select **Place Waypoint at Vessel** from the Waypoint menu, or, click **Marks/Wpt at Vessel** on the function bar.

   The Waypoint At Vessel information dialog box appears (Figure 4-16). The dialog box shows the time the waypoint is added, and has a space where you can type relevant information, such as location, water depth and temperature, etc.

2. Type your information into work space (optional), then click OK to place new waypoint on the chart.
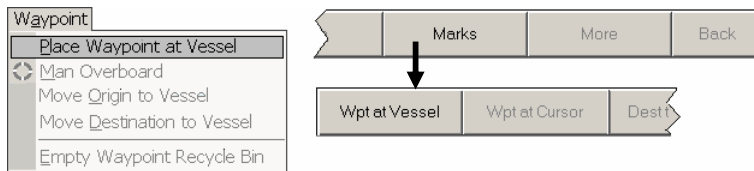
Figure 4-15. Placing A Waypoint At The Vessel's Current Position
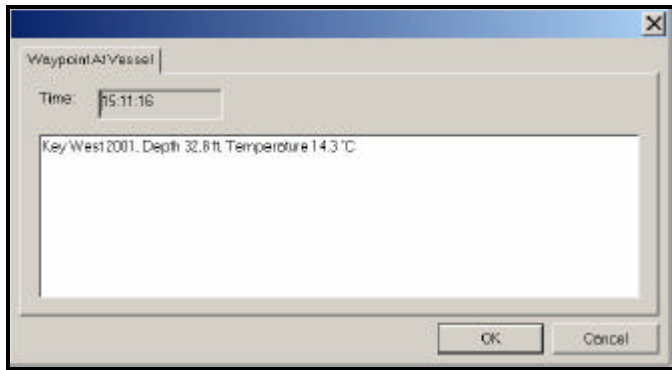
Figure 4-16. Waypoint At Vessel Information Dialog Box

To put a new waypoint at the cursor's current position:

1. As shown in Figure 4-17, click **Marks/Wpt at Cursor** on the function bar (this function cannot be accessed from the Waypoints drop-down menu).

   The Standard cursor ⊕ changes to the Route cursor ⊕.

2. Place the cursor where you want the new waypoint, then left-click. The new waypoint appears on the chart.
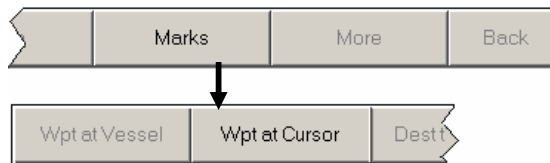
Figure 4-17. Placing A Waypoint At The Cursor's Current Position

To put a man overboard waypoint at the vessel's current position:

1. As shown in Figure 4-18, select **Place Waypoint at Cursor** from the Waypoint menu, click MOB on the toolbar, or click **More/More/Man Overboard** on the function bar.

    The man overboard marker is placed automatically at the vessel's current position, Navigator calculates the most direct route back to the marker, and automatically makes that route the active route.
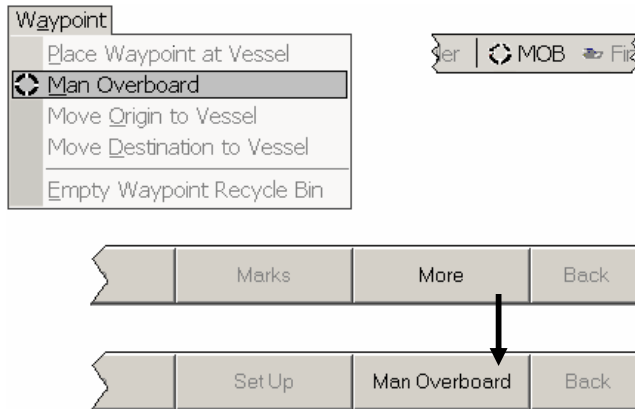
Figure 4-18. Placing A Man Overboard Marker

To delete a waypoint from a route:

1. Place the cursor over the waypoint you want to delete, then right-click to display the Chart Action popup menu (Figure 4-19).

2. Select **Delete Waypoint**. The waypoint is removed from the chart.

> **Note:** *You can also delete waypoints from the Waypoint Properties dialog box. Refer to "Modifying Waypoints" later in this section.*
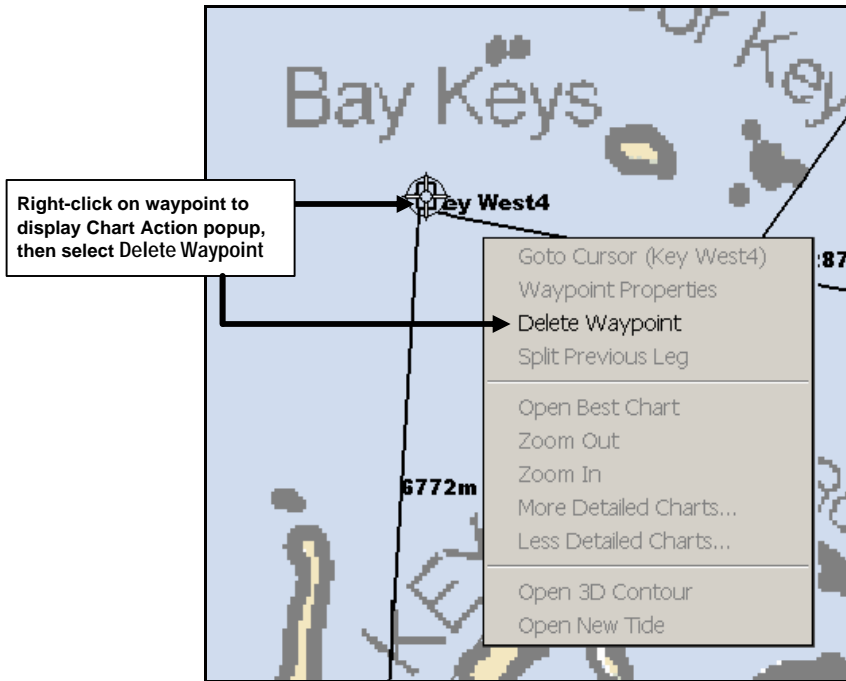
Figure 4-19. Deleting a Waypoint

Modifying Waypoints

You can change how/where/when any waypoint is displayed by editing the Waypoint Properties dialog box.

To modify a waypoint's display characteristics:

1. Place the cursor over the waypoint you want to modify, then right-click to display the Chart Action popup menu.

2. Select **Waypoint Properties** to display the Waypoint Properties dialog box (Figure 4-20).

Note: *You can also double-click on a waypoint to display the Waypoint Properties dialog box.*
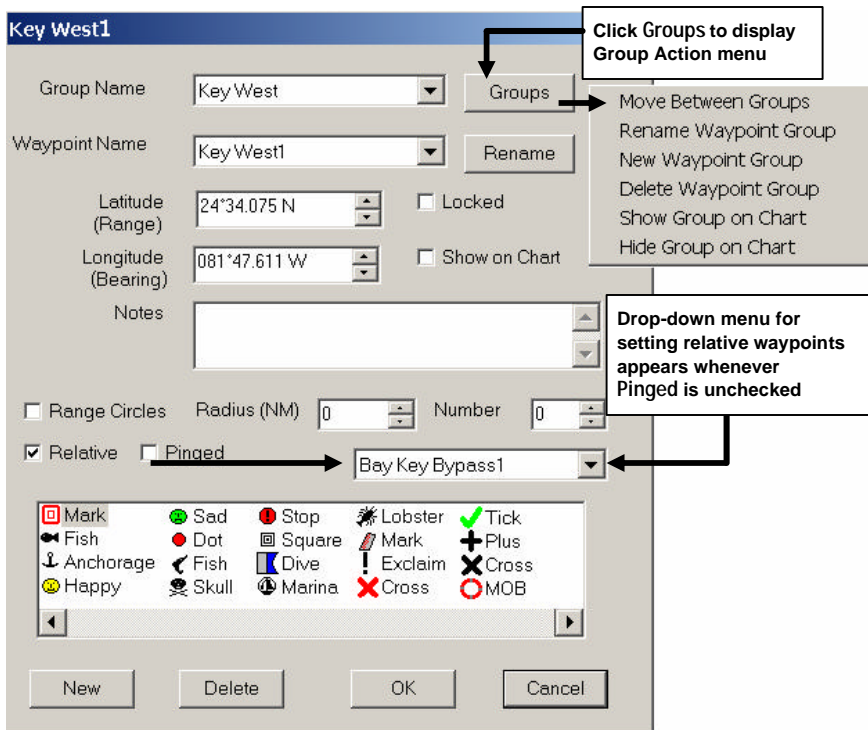
Figure 4-20. Waypoint Properties Dialog Box: Editing Waypoints

The Waypoints Properties dialog box contains the following:

- **Group Name** field –Name of waypoint group.

- **Groups** button – Displays group action menu (Fig. 4-20).

- **Waypoint Name** field – Name of waypoint.

- **Rename** button – Click to rename waypoint.

- **Latitude** field – Latitude coordinate of waypoint.

- **Range** field – Displayed only if **Relative** box is checked and **Pinged** box is unchecked. Displays range of waypoint in Metric or English units. Refer to "Setting Relative Waypoints" for more information.

- **Locked** checkbox – If checked, waypoint cannot be accidentally dragged from its chart insertion point.

- **Longitude** field – Longitude coordinate of waypoint.

- **Bearing** field – Displayed only if **Relative** box is checked and **Pinged** box is unchecked. Displays bearing of waypoint in Metric or English units. Refer to "Setting Relative Waypoints" for more information.

- **Show on Chart** checkbox – If checked, waypoint is displayed on chart

- **Notes** window – Additional information about waypoint.

- **Range Circles** checkbox – If checked, range circles are displayed around waypoint.

- **Radius (NM)** field –Range Circle radius in Nautical Miles.

- **Number** field – Number of Range Circles displayed.

- **Relative** checkbox – If checked, enables you to place a waypoint that remains relative to another waypoint. Refer to "Setting Relative Waypoints" for more details.

- **Pinged** checkbox – Refer to "Setting Relative Waypoints" for more information.

- Relative waypoint drop-down menu – Displayed only if **Relative** box is checked and **Pinged** box is unchecked. Choose the waypoint you want the current waypoint to be relative-to — refer to "Setting Relative Waypoints" for more information.

- Marker icons display window – Displays the various icons you can use to represent the waypoint.

  - **New** button – Adds a new waypoint to the group.

  - **Delete** button – Deletes the waypoint from the group.

Setting Relative Waypoints

This subsection explains how to set a waypoint so that it is always displayed the same relative distance from another waypoint.

To set one waypoint as relative to another:

1. As explained previously, create two waypoints, or, decide which two existing waypoints you want to use. For the sake of this example, we'll call the first waypoint WP1 and the second WP2.

2. On the chart, double-click WP2. The Waypoint Properties dialog box is displayed (Figure 4-20).

3. Click the **Relative** checkbox. The **Pinged** checkbox appears to the right of the Relative checkbox.

4. Click the **Pinged** checkbox to "uncheck" it. The Pinged checkbox disappears and a drop-down menu with a list of waypoint names appears. Observe that the **Latitude** and **Longitude** fields also switch to **Range** and **Bearing**, respectively.

5. Click the drop-down menu, and select WP1 from the list.

6. In the **Range** field, type the range at which you want WP2 to remain relative from WP1. For example, if you enter 300 miles, WP2 will always remain at a range of 300 miles from WP1, no matter where WP1 is repositioned on the chart.

7. In the **Bearing** field, type the bearing at which you want WP2 to remain relative from WP1. For example, if you enter 90 degrees, WP2 will always remain at a bearing of 90 degrees from WP1, no matter where WP1 is repositioned on the chart.

8. Click **OK** to save your changes and close the Waypoint Properties dialog box.

To temporarily set one waypoint to specific coordinates:

1. Double-click on WP2 to display the Waypoint Properties dialog box (Figure 4-20).

2. Make sure that the **Relative** and **Pinged** boxes are checked.

3. Type the specific coordinates for WP2 into the **Latitude** and **Longitude** fields.

4. Click **OK** to close and save your settings. WP2 is then displayed at the new coordinates, while WP remains in its originally position. The previous relative settings for WP2 are stored by Navigator, so you can return the waypoint to its relative setting when needed..

To return a waypoint to its relative coordinates:

1. Double-click on WP2 to display the Waypoint Properties dialog box (Figure 4-20).

2. Click the **Pinged** box to uncheck it.

3. From the drop-down that appears, select WP1.

4. Click **OK** close and return WP2 to its relative coordinates.

Working With Waypoint Groups

You can create as many different groups of waypoints as you need, and then manipulate the individual waypoints within those groups. Waypoint groups can be added/deleted/renamed just like individual waypoints, and waypoints can be swapped between groups, sent-to and retrieved-from the Waypoint Recycle Bin.

To create a new waypoint group:

1. Select **Edit Route** from the Route menu, then click **Waypoint Properties** to display the Waypoint Properties dialog box (Figure 4-20).

2. As shown in Figure 4-20, click **Groups** to display the Group Action popup menu.

3. Select **New Waypoint Group**. The Rename Waypoint Group dialog box is displayed (Figure 4-21).

4. Type the name for the new group, then click **OK**.
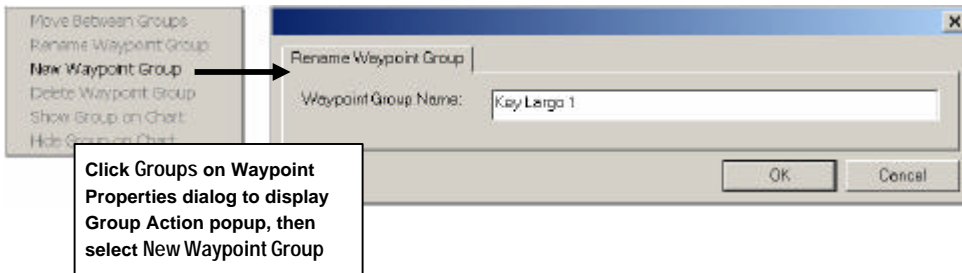
Figure 4-21. Creating a New Waypoint Group

To rename a waypoint group:

1. Double-click on a waypoint (or select **Edit Route** from
    the Route menu, then click **Waypoint Properties**) to
    display the Waypoint Properties dialog box (Figure 4-20).

2. Click the **Group Name** drop-down menu, then select the
    group you want to rename.

3. As shown in Figure 4-20, click **Groups** to display the
    Group Action popup menu.

4. Select **Rename Waypoint Group**. The Rename Waypoint
    Group dialog box is displayed (Figure 4-22).

5. Type the name for the new group, then click **OK**.
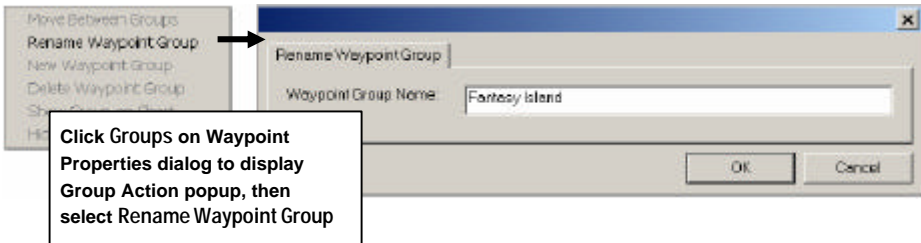
Figure 4-22. Renaming a Waypoint Group

To delete a waypoint group:

1. Double-click on a waypoint (or select **Edit Route** from the Route menu, then click **Waypoint Properties**) to display the Waypoint Properties dialog box (Figure 4-20).

2. Click the **Group Name** drop-down menu, then select the group you want to delete.

3. Click **Groups** to display the Group Action popup menu.

4. Select **Delete Waypoint Group**. A dialog box appears (Figure 4-23) warning you that deleting a waypoint group also deletes the waypoints that group shares with others (if any) — use care.

5. Click **Yes** to delete the waypoint group.
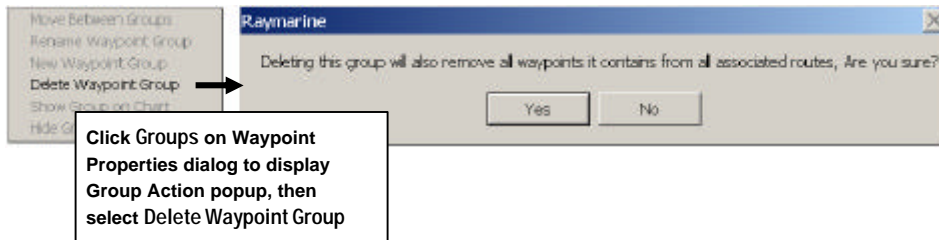
Figure 4-23. Deleting a Waypoint Group

To display or hide a waypoint group:

1. Double-click on a waypoint (or select **Edit Route** from the Route menu, then click **Waypoint Properties**) to display the Waypoint Properties dialog box (Figure 4-20).

2. Click the **Group Name** drop-down menu, then select the group you want to delete.

3. Click **Groups** to display the Group Action popup menu.

4. Select **Show Group on Chart** to display the waypoints, or **Hide Group on Chart** to remove them. A confirmation dialog appears (Figure 4-24).

5. Click **OK** to show or hide the waypoints.
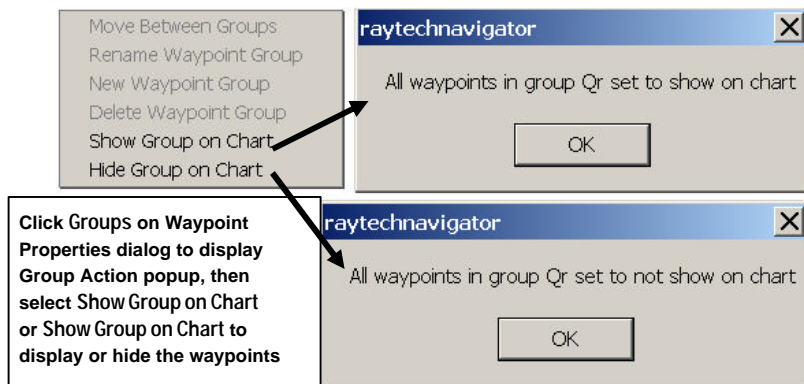
Figure 4-24. Showing or Hiding a Waypoint Group

Using the Waypoint Recycle Bin

When you delete waypoints, they are placed into a recycle bin from which you can later (in the same Navigator session) retrieve them if you need to. It's important to keep in mind that the waypoint recycle bin is emptied, permanently deleting all waypoints it contains, <u>each time</u> you restart Navigator.

To retrieve waypoints from the recycle bin:

1. Select **Edit Route** from the Route menu, then click **Waypoint Properties** to display the Waypoint Properties dialog box (Figure 4-20).

2. As shown in Figure 4-25, click the **Group Name** drop-down, then select **Recycle Bin** from the displayed choices. The Move Waypoints Between Groups dialog box is displayed (Figure 4-26).

   The Move Waypoints Between Groups dialog box contains two drop-down menus that allow you to select the waypoint groups you want to move waypoints between.

3. From the left-most drop-down, select the waypoint group you want to restore waypoint to (Figure 4-26).

4. From the right-most window (the Recycle Bin), select the waypoints you want to retrieve.

5. Click [Move ->] to retrieve and restore the waypoints.
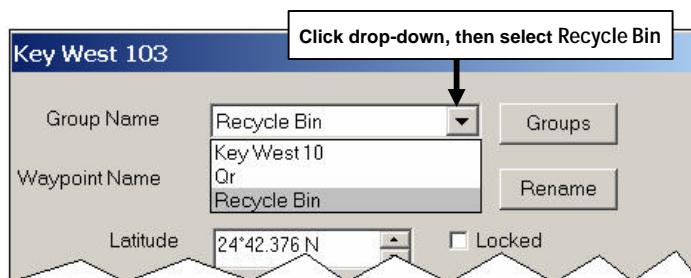
Figure 4-25. Selecting the Recycle Bin

STEP 1. Click drop-down, then select waypoint group to restore to

STEP 2. Select waypoints you want to retrieve from Recycle Bin

Recycle Bin

Key West 103

Move ->

STEP 3. Click Move -> to retrieve and restore waypoints

<- Move

Key West 10

Key West 10
Qr
Recycle Bin
Key West 104
Key West 105
Key West 106
Key West 107
Key West 108
Key West 109

OK   Cancel
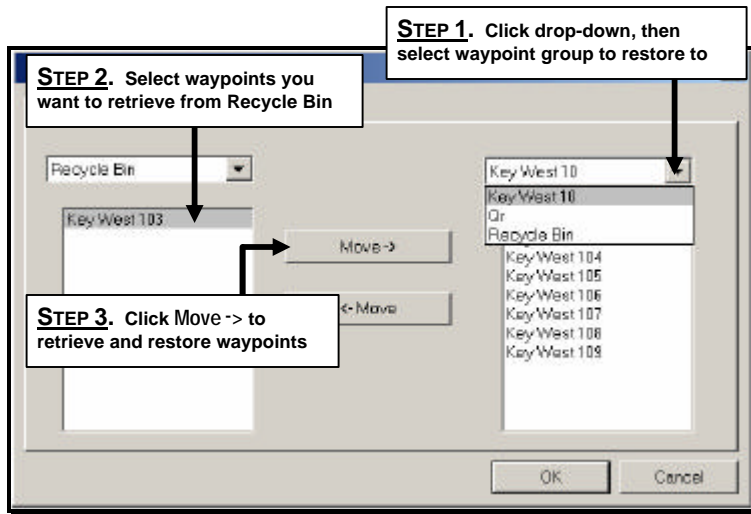
Figure 4-26. Retrieving Waypoints From The Recycle Bin

Chapter 5
Advanced Navigator Functions

Overview

This chapter covers the more advanced Navigator functions such as Radar and Sonar. It also includes information about using Polars data and graphics to analyze and fine-tune your racing sailboat's performance.

Using Radar With Navigator

This sections explains how to use the various Radar functions within Navigator. Data from your hsb^2 Series Pathfinder Radar can be transferred and displayed (repeated) in a Navigator. The radar output can be displayed in a separate window or overlaid on a chart. Connection is made from the hsb^2 connection via a special cable that inputs to a PCMCIA card in your PC

When a scanner is connected and the radar is in Transmit mode, the radar picture provides a map-like representation of the area in which the radar is operating. Typically, your ship's position is at the center of the display, and its dead ahead bearing is indicated by a vertical heading line, known as the Ship's Heading Marker (SHM).

The radar picture can be viewed with a variety of fixed or customized range scales. The color of the radar returns (echoes) indicates their intensity: the strongest returns are shown in yellow and the weaker are shown in shades of blue. A status bar at the top of the radar image displays range, current heading and mode indicators for the various options you can set.

The radar display can show additional information, depending on your currently selected options, set up selections and the data available from other equipment. The example displays on the following pages show some of these features.

The hsb^2 Series Pathfinder Plus Radar system includes the following:

- Range scales: 1/8nm to 24nm up to 72nm (scanner-dependent).

- Automatic and manual control of tuning, gain and sea clutter.

- Two Variable Range Markers (VRMs) and Electronic Bearing Lines (EBLs), allowing target range and bearing measurements.

- Target wakes and target expansion mode.

- Add marks to record important or dangerous locations.

- 10 Target MARPA for target tracking and risk analysis.

You can use this chapter with the radar display set to simulator mode, or on the water after you have installed and set up your *hsb*^{2} Series Pathfinder Plus Radar system.

> **Note:** Until you are familiar with interpreting the radar display, you should take every opportunity to compare the radars display patterns with visual targets, such as other vessels, buoys and coastal structures. You should practice harbor and coastal navigation during daylight and in clear weather conditions.

You can identify objects using either the radar/chart overlay or the cursor echo feature: With cursor echo on you can select an object on the radar display, the cursor is repeated on the chart display so you can check the objects identity.
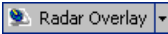
Displaying the Radar Screen

Data from your Pathfinder PLUS Radar can be repeated in a separate RayTech Navigator window or overlaid on a chart.

To display radar data in a separate window:

1. Make sure the radar is operational and correctly connected to the PC.
2. Power on the radar unit.
3. Click **File/Open**. The Open window appears.
4. Double click the **Radar** icon. The radar window opens with the radar function in Standby mode.
5. From the Pathfinder Panel, click the **POWER** button. Radar data is repeated over hsb^2 and displayed in the window.

To overlay radar data on top of a chart:

1. Open a chart for your current area.
2. Click the Radar Overlay button ⬛ Radar Overlay ▾ on the toolbar. Radar data is displayed over the chart.
3. Click the down arrow adjacent to the Radar Overlay window. The transparency slider appears.
4. Move the transparency slider up/down to decrease/increase the overlay's transparency over the chart.

Displaying the "Top Line" Status Header

You can display a "Top Line" header above the radar window that shows current status of the radar display settings.

To display the Top Screen:

1. From within the Radar Window, click the right mouse button.

2. Select **View/Top Line** to toggle the Top Line on. The informational header appears at the top of the radar window displaying range, rings, course, heading, which settings are set for automatic from GAIN, SEA and TUNE, and whether Interference Rejection (IR) or Target Expansion (EXP) have been set.

3. Click the right mouse button and select **View/Top Line** again to toggle the Top Line off. The top line header disappears and the size of the radar window is maximized.

Displaying the Control Panel

You can display a Control Panel dialog box on the outside of the radar window, which enables you to modify a number of radar settings.

To display the Control Panel:

1. From within the Radar Window, click the right mouse button.

2. Select **View/Control Panel**. The Control Panel (Figure 5-1) is displayed along the side of the radar window.

3. Click the right mouse button and select **View/Control Panel** again to toggle the Control Panel off. The box disappears and the size of the radar window is maximized.
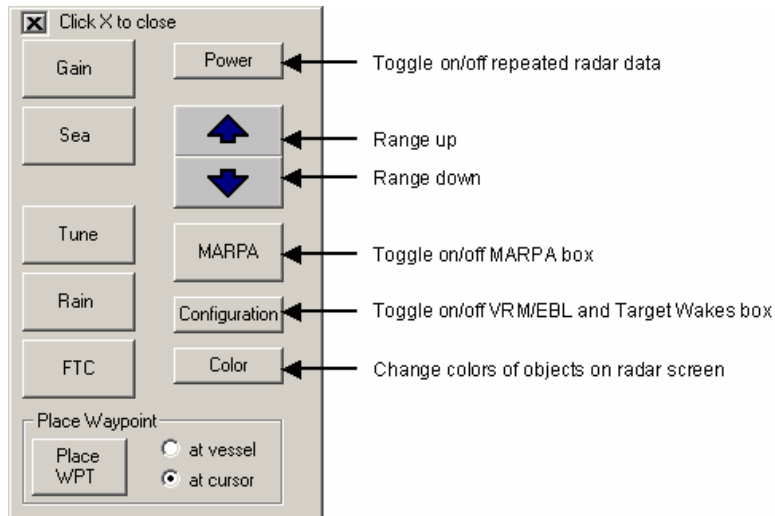
Figure 5-1. Radar Control Panel

Using the Pathfinder Panel Toolbar

The Pathfinder Panel is a special toolbar that simulates the functions of the buttons of the *hsb*[2] Series Radar and Fishfinder display units. When one of the buttons is pressed, the associated soft key functions appear in the function bar below. You can access the Pathfinder Panel from either the View Menu or the Toolbars button on the Standard toolbar.

When the Radar window is active, clicking the Pathfinder Panel buttons displays the following:

- **GAIN** –FTC, RAIN, SEA, and GAIN Radar Functionbar buttons

- **VRM/EBL** – VRM/EBL Radar Functionbar buttons

- **MULTI** – Tune Radar Functionbar button

- **ALARMS** – no effect

- **DISPLAY** –Open Window dialog box

- **MARKS** –Waypoint Mark Radar Functionbar buttons

- **RANGE** – increases/decreases radar viewing range

- **ENTER** – previous Radar Functionbar menu level

- **CLEAR** – previous Radar Functionbar menu level

- **MENU** – System Setup, Clear Marks, EBL, and MARPA Setup Radar Functionbar buttons

- **POWER** – toggles Radar transmit/standby modes

Using the Range Control

The radar display can be viewed at various scales by using the range (zoom) control. The shortest range scale gives a maximum range of 1/8 nautical miles, measured from the default center to the top of the radar picture. The longest range scale gives a maximum range of between 24 and 72 nautical miles, depending upon the type of your scanner.

- The *long* range scales provide the best overview of your vessel's relation-ship to land masses, weather fronts and large ship targets in or beyond view.
- The *short* range scales provide greater detail of the radar echoes close to your vessel, and should be used as you approach the coastline, harbor or other vessels in the area.

The Pathfinder Plus Radar display includes concentric range rings, that you can use to help you to judge distances on the radar picture. Their number and spacing are adjusted automatically if you change the range scale.

Changing the Range

Each time you click the **RANGE** button on the Pathfinder Panel, the range changes to the next available setting.

The range scale and range ring interval indicators, at the left-hand end of the status bar, are updated whenever you change the range.

The Standard Range Scale

Details of the standard ranges are shown in the table below. You can also customize the range scales by specifying different ranges.

Radar Range Scales

Maximum Range (nm)	Number of Range Rings	Range Ring Interval (nm)
0.125	2	0.0625
0.25	2	0.125
0.5	4	0.125
0.75	3	0.25
1.5	6	0.25
3	6	0.5
6	6	1
12	6	2
24*	6	4
48*	6	8
72*	6	12

* The maximum range depends on your scanner type.

The number of range rings shown in the table is the number to the selected range. Additional range rings are displayed toward the edge of the radar picture, at the standard ring interval for the current range, and are visible when the center is offset.

Determining Actual Radar Range

The actual maximum radar range is essentially line-of-sight, and is limited by the height of the scanner and the height of the target as shown below lists some range examples:

Radar Range

Antenna Height (m)	Target Height (m)	Maximum Range (nm)
3	3	7.8
3	10	10.9
5	3	8.9
5	10	12.0

Note: The ranges shown in the table are theoretical maximum ranges. The radar horizon is greater than the optical horizon, but the radar can only detect targets if a large enough target is above the radar horizon.

Interpreting and Adjusting the Radar Picture

Navigational echoes may be large, small, bright or faint, depending not only on the size of the object but also on its orientation and surface. Different objects reflect the radar signals in different ways. For example, vertical objects such as cliffs reflect signals better than sloping ones such as sandbanks.

High coastlines and mountainous coastal regions can be observed at the longest radar range. However, the first sight of land may be a mountain several miles inland from the coastline. The actual coastline may not appear on the radar until the vessel is close to the line of sight distance.

The radar indication may not be similar to your visual observation; a nearby small object may appear to be the same size as a distant large object on the radar. However, with experience the approximate size of different objects can be determined by the relative size and brightness of the echoes.

Some targets, such as buoys and small boats, can be difficult to differentiate, since they bob and toss about in the waves and do not present a consistent reflecting surface. Consequently, these echoes have a tendency to fade and brighten and, at times, to disappear momentarily. Buoys and small boats often resemble each other, but boats can usually be distinguished by their motion.

Not all radar echoes are produced by hard navigational items. Some echoes may be received from irregularities on the surface of the water, particularly at close range (sea clutter), or from rain or snow either around the vessel or in the distance. In addition, some echoes may be indirect returns to the radar scanner, providing false echoes or multiple echoes.

The effects of many false echoes can be minimized, and the target presentation clarified using the controls summarized below. This section explains how to interpret the radar picture and how the controls affect the display. It provides instructions for adjusting the settings, describes the circumstances in which they should be adjusted, and how they interact with each other.

Controls to Adjust the Radar Picture

Control	Option	Function	Default Setting
GAIN	GAIN	Controls the strength of the target returns	AUTO
	SEA	Reduces sea returns	AUTO-HARBOR
	RAIN	Reduces close rain or snow returns	OFF
	FTC	Reduces distant rain or snow returns	OFF
SEA	SEA	Reduces sea returns	AUTO-HARBOR
MULTI	TUNE	Fine tunes the receiver	AUTO
TARGETS	INT REJ	Turns interference rejection on/off	ON
	EXPANSION	Turns target expansion on/off	OFF
	WAKES	Turns wakes on/off and selects wakes length	OFF

Identifying False Echo Returns

Not all echoes are direct returns to the radar antenna. Occasionally signals appear at positions where there is no actual target. These are called *false echoes*, and may be caused by side lobes, ghost images, indirect echoes or multiple echoes.

This subsection briefly describes the echo patterns that can be produced by false echoes and the likely cause. It should be noted that the radar operator, through observation, practice, and experience, can generally detect these conditions very quickly. These effects can usually be minimized using the radar controls.

Side Lobes

A small part of the RF energy from each transmitted pulse is radiated outside the single narrow beam. This produces side lobe patterns, shown in Figure 5-2. Side lobes have no effect on distant or small surface objects; however, the echo from a large object at short range may produce an arc on the radar screen similar to a range ring or a series of echoes forming a broken arc. Side-lobe echoes normally occur at ranges below 3nm, and can be reduced by adjusting the SEA control.
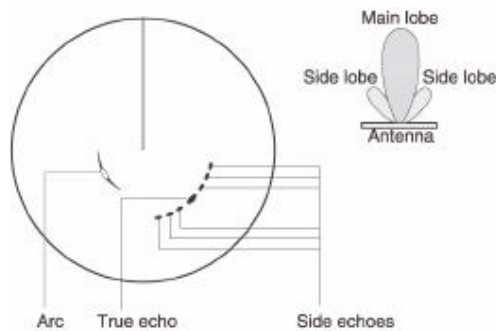
Figure 5-2. Radar Side Lobe Echo Affects

Indirect (False) Echoes

There are several types of indirect echoes or ghost images (Figure 5-3). These sometimes have the appearance of true echoes, but in general they are intermittent and poorly defined.
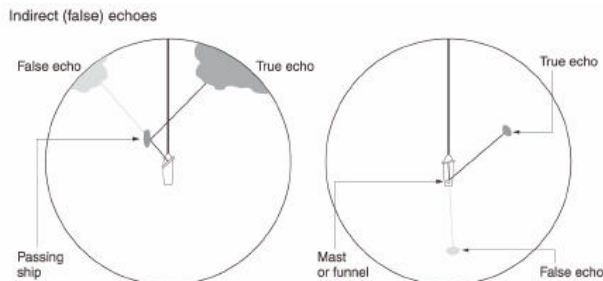
Figure 5-3 Radar Indirect Echo Affects

Multiple Echoes

Multiple echoes (Figure 5-4) appear if there is a large target with a wide vertical surface at a comparatively short range. The transmitted signal will be reflected back and forth between the target and your own ship. Multiple echoes therefore appear beyond the true targets echo on the same bearing, as shown in the figure below. This is not very common.
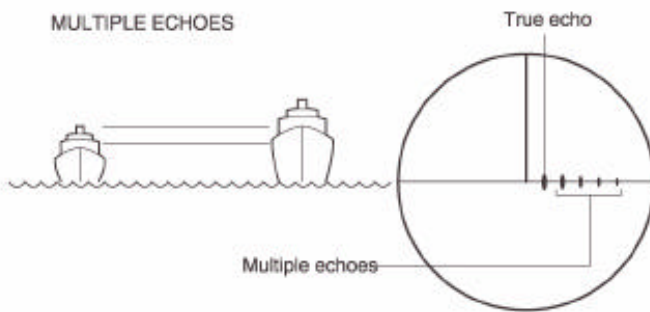
Figure 5-4. Radar Multiple Echo Affects

Blind Sectors or Shadow Effect

Funnels and masts located near the antenna, may cause shadows. In shadow areas beyond the obstruction there will be a reduction of the beam intensity, although not necessarily a complete cut-off. However, there will be a blind sector if the subtended angle is more than a few degrees. There may also be multiple echoes that extend behind the obstruction. This should be avoided by careful selection of the scanner site prior to installation.

Radar Gain Control

The Gain control adjusts the level of the display of signals received from the scanner; it is equivalent to a volume control on a radio. The Gain control can be set either to Auto or Manual modes.

In Auto mode, the Pathfinder Plus radar optimizes the setting. In harbors or close proximity to land different auto settings may be necessary to cater for the effects of land clutter.

Alternatively, set both Sea Clutter and Gain to Manual mode, and then adjust the settings to ensure that all close small targets are visible. When the Gain control is set to Manual, you should check it every time you change the range scale. On long range settings, the gain should be set to give a slight speckle in the background of the radar picture. On shorter ranges, you may wish to reduce the gain slightly to reduce the speckle and therefore improve target definition. Do not set the gain too low, or you may miss small or weak targets. The new Gain mode (auto or manual) and values are also retained each time you turn the radar off or on.

> *Note*:   Gain can only be adjusted if the control is set to
> Manual adjustment. Because the SEA control affects
> the gain, you may need to manually readjust it if you
> manually change the Gain setting.

To adjust the Gain:

1.   Select a range appropriate to the adjustment you want to make.

2.   From the Pathfinder Panel, click the **GAIN** button. The Gain Functionbar buttons are displayed.
     or
     Click the right mouse button and select **View/Control Panel**. The Control Panel appears.

3.   Click the **GAIN** Functionbar button . The button toggles the control between Auto and Manual mode.

4.   If you select Manual mode, the arrow control buttons appear. Use the up/down arrows to increase/decrease the Manual Gain. **Important:** Because the changes to the settings are made immediately, you cannot revert to the previous setting by clicking **CLEAR**.

5.   When you have set the controls to the levels you require, press **ENTER**, **CLEAR**, or **BACK** to return to the default level of soft keys.

Sea Clutter Control

Radar returns from waves around your vessel can clutter the center of the radar picture, making it difficult to detect real targets. Sea clutter (Figure 5-5) usually appears as multiple echoes on the display at short range scales, and the echoes are not repetitive or consistent in position. With high winds and extreme conditions, echoes from sea clutter may cause dense background clutter in the shape of an almost solid disc.
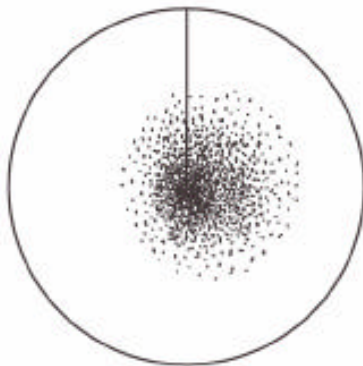
Figure 5-5. Radar Sea Clutter Display

The Sea Clutter control reduces the gain level in the areas near your vessel, extending up to 3 to 5nm depending on the wave and sea conditions. This has the effect of reducing the sea returns to intermittent small dots, while small targets are still visible. Gain levels further from your vessel remain unchanged. You can use the Gain and Sea Clutter control to help minimize the effects of side lobes.

The SEA control can be set to Auto-Harbor (default), Auto-Offshore or Manual mode. In Auto-Offshore mode, the Pathfinder Plus Radar optimizes its settings to account for the effects of sea clutter. In harbors or close proximity to land different auto settings may be necessary to cater for the effects of land clutter. To avoid losing small targets it is therefore advisable to set the Sea control to Auto-Harbor mode. Alternatively, set both Sea and Gain to Manual mode then adjust the settings to ensure that all close small targets are visible.

To adjust Sea Clutter control:

1. Select a range appropriate to the adjustment you want.

2. From the Pathfinder Panel, click the **GAIN** button.
    The Gain buttons are displayed.
    or
    Click the right mouse button and select **View/Control Panel**. The Control Panel appears.

3. Click the **SEA** button. The button toggles the control between Auto-Harbor, Auto-Offshore and Manual mode.

4. Select Manual mode to display the arrow control keys. Use the up/down arrows to increase/decrease the Manual Sea Clutter setting. The image on the screen changes as change the value, so that you can see the effect of your adjustment. **Important:** Because the changes to the settings are made immediately, you cannot revert to the previous setting by clicking **CLEAR**.

5. When you have set the controls to the levels you require, click **ENTER**, **CLEAR**, or **BACK** to return to the default menu level of the Functionbar.

Rain Clutter Control

The radar can see echoes from rain or snow. Returns from storm areas and rain squalls consist of countless small echoes that continuously change size, intensity, and position (Figure 5-6). These returns sometimes appear as large hazy areas, depending on the intensity of the rainfall or snow in the storm cell.

The RAIN and FTC controls are used to reduce this clutter, so that targets masked by the clutter can be seen on the radar picture.

- The RAIN control is used to reduce large clutter masses around your vessel caused by rain or snow.

- The FTC (Fast Time Constant) control is used to reduce rain clutter at a distance from your vessel, such as that shown below.
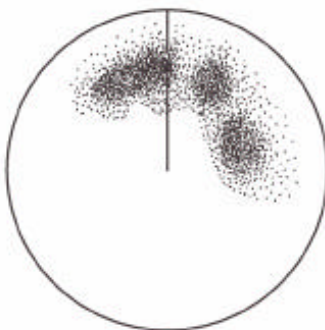
Figure 5-6. Radar Rain Clutter Display

When the FTC control is turned up, only the leading edge of large (rain clutter) echoes is displayed, while the effect on smaller (ship) echoes is only slight. This means that you can also use the control on shorter ranges to distinguish between two very close echoes on the same bearing, which may otherwise merge and appear as one echo.

When the FTC control is turned up, the receiver is less sensitive, and there is a reduction of background noise and fill-in returns from land and large targets. You should therefore turn the control down when its use is not required. Since storm cells are usually visible for long distances due to their extreme altitude, you may wish to leave them displayed so that you can observe the location of bad weather.

If you turn the RAIN or FTC control Off (equivalent to setting the level to 0%), the actual setting is stored, and restored when you turn the control on again. Keep in mind however, that RAIN and FTC are reset to Off at power-on.

To adjust the RAIN and FTC controls:

1. Select a range appropriate to the adjustment you want to make.

2. From the Pathfinder Panel, click the **GAIN** button. The Gain buttons are displayed.
    or
    Click the right mouse button and select **View/Control Panel**. The Control Panel appears.

3. Click the **RAIN** and **FTC** buttons. The buttons toggle between ON and OFF.

4. If you select ON , the arrow control keys appear. Use the up/down arrows to increase/decrease the RAIN and FTC settings.

5. When you have set the controls to the levels you require, click **ENTER**, **CLEAR**, or **BACK** to return to the default menu level of the Functionbar.

Tuning the Receiver

The TUNE control is used to fine-tune the receiver in the scanner for maximum target returns on the display. In Auto mode, the radar tunes itself automatically on all range scales. **Raymarine recommends that you leave the TUNE control in Auto mode.**

If you set the TUNE control to Manual, you will need to adjust it about 10 minutes after you have turned on the radar, since the required setting changes after the magnetron has warmed up.

Adjust the control to obtain the maximum signal strength, as indicated in the 8-step signal strength bar above the slider.

To tune the radar:

1. Select a range appropriate to the adjustment you want to make. The optimum Tune setting varies slightly for different ranges, depending on the pulse width used.

2. On the Pathfinder Panel, click the **MULTI** button.

3. Press the **TUNE** button. The button toggles the control between Auto and Manual mode.

4. Select Manual mode to display the arrow control buttons and signal-strength meter. Use the up/down arrows to increase/decrease the Manual TUNE adjustment to obtain the maximum reading on the meter. **Important:** Because the changes to the settings are made immediately, you cannot revert to the previous setting by clicking **CLEAR**.

5. When you have set the controls to the levels you require, click **ENTER**, **CLEAR**, or **BACK** to return to the default menu level of the Functionbar.

Changing the Target Display

The Pathfinder PLUS Radar allows you to improve target visibility by changing the following:

- Interference rejection (**In Rej**)

- Target expansion (**Expansion**)

- Target wakes (**Wakes**)

These controls are accessed from the Functionbar **Targets** Button.

To change target mode settings:

1. Click the **Targets** button.

2. Click **In Rej** to toggle On/Off.

3. Click **Expansion** to toggle On/Off.

4. Click **Wakes to** select Off, Short, Medium, or Long wakes.

5. Click **Clear Wakes** to remove wakes from the screen.

You can use the buttons to change the settings of any or all the modes. The top screen status bar updates to indicate which controls are on.

Interference Rejection

Mutual radar interference is likely when two or more radar-equipped vessels are operating within range of each other. This usually appears as a series of small dots moving to and from the display center in a straight line or a long, sweeping curve (Figure 5-7). This type of interference is most noticeable at long ranges.
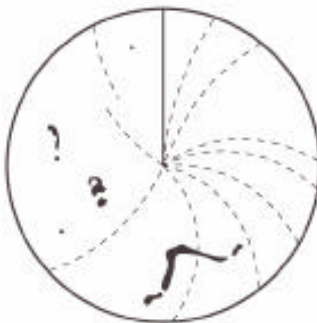
Figure 5-7. Radar Interference Rejection Display

The Pathfinder PLUS Radar includes a mechanism that automatically reduces such interference. This mechanism is normally left switched on. However, if you wish to detect the presence of other radars in the vicinity, you can turn off the interference rejection.

Target Expansion

You can make targets easier to see by expanding them. The scanner type determines the range at which target expansion is available. Target expansion overrides the normal pulse length, thereby increasing the size of the target seen on the screen. However, this is at the expense of range resolution.

Target Wakes

You can see the direction and speed with which targets are moving relative to your vessel by selecting the target wakes display option.

When wakes are switched on, the target is displayed at the brightest level and the previous positions of targets are retained at successively fainter levels on the screen. You can select long, medium or short wakes, which retain information from previous scans at a reduced video level.

You can clear existing wakes from the display by clicking the **Clear Wakes** Functionbar button. When wakes are switched off, no new wakes are displayed and existing wakes are cleared.

Measuring Range and Bearing Using VRM/EBL

The Pathfinder Plus Radar display allows you to specify up to two Electronic Bearing Lines (EBL)s each with an associated Variable Range Marker (VRM), using the **VRM/EBL** button on the Pathfinder Panel.

A standard VRM is displayed as a circle with its center on your vessel's position, and its EBL is displayed as a line from the origin to the edge of the radar picture display (Figure 5-8).

Figure 5-8. Radar VRM/EBL Display

> **Note:** *When using VRM/EBL, you may want to turn off the range rings to make the VRMs clearer. To do this, use the Color control in the Control Panel to change the color of the range rings to the same color as the background.*

When a VRM/EBL pair is active, its bearing and range are displayed in its associated data box, which can be moved, deleted or reinstated. VRMs move if you change the range scale, so that the actual range you have marked is maintained. VRM/EBLs also move if you offset the center.

The bearing information is displayed as either the bearing relative to your vessels heading or (if heading data is available from a position fixer or compass) the actual bearing in degrees magnetic or degrees true. These are controlled by the setup parameters.

The VRM/EBL functions allow you to perform the following tasks:

- Measure the range of a target or point from your vessel's position, using a VRM.

- Measure the bearing of a target or point from your vessel's position, using an EBL.

> **Note:** *Range and bearing measurements are displayed in the Data box. You can determine the range and bearing by moving the cur-sor over the target and checking the Data Box readings. You can also estimate the range to a target by reference to the range rings.*

Measuring Range and Bearing to Target from Vessel

To measure the range and/or bearing of a target or point from your vessels position, you need to place a VRM/EBL and move it so that it crosses the target or point for which you require the bearing or range. When you turn on a VRM/EBL, it is displayed in its last-used position.

> **Note:** If the VRMs last-used position is outside the radar picture at the current range setting, it is placed at its default position instead. This is one third of the range for VRM1, and two-thirds for VRM2.

Using VRM/EBL

To access VRM/EBLs:

1. Click the **VRM/EBL** button on the Pathfinder Panel. The VRM/EBL buttons are displayed.

2. Click the button that corresponds with the action you want:

<u>Click:</u>	<u>To:</u>
VRM/EBL On/Off	Display VRM/EBL in its last-used position/Remove the VRM/EBL from the radar display.
Edit VRM/EBL	Modify the selected VRM/EBL combination.
Edit VRM	Modify the selected VRM.
Edit EBL	Modify the selected EBL.
Databox On/Off	Display/Remove Databox.

3. Click **Databox On/Off** to display range and bearing.

Moving a VRM/EBL

You can control VRM/EBL separately or together.

To move a VRM or EBL:

1. Click the **VRM/EBL** button on the Pathfinder Panel.

2. Click the button that corresponds to what you want to modify: **VRM/EBL 1** or **VRM/EBL 2**. A drop-down dialog box for the selected VRM/EBL appears.

3. Click **VRM/EBL On** to display the selected VRM/EBL on the radar picture in its last-used position. The object is displayed with dashed-lines.

4. From the drop-down dialog box, select the item that corresponds to the action you want:

To Move:	Click:
Selected VRM/EBL combination	**Edit VRM/EBL**
Selected VRM only	**Edit VRM**
Selected EBL only	**Edit EBL**

5. The selected object is displayed as a solid line. The cursor appears with arrows on all four corners.

6. Press and hold the left mouse button as you drag the EBL to the new angle and/or change the VRM radius (range).

7. Release the mouse button to drop the VRM/EBL in its new position. The object is again displayed with dashed-lines.

Placing Marks

The Marks function allows you to place a mark anywhere on the radar screen. Radar marks are not the same as chart waypoints and cannot be used in routes, nor can they be transferred to other displays.

Marks are placed with the default mark symbol at either cursor or vessel position. Marks are stored with their latitude, longitude and symbol; and the information is retained when the radar is turned off.

To place a mark symbol at the cursor position:

1. On the Pathfinder Panel, click the **MARKS** button, then click the **Wpt at Cursor**.
   or
   Press the right mouse button and select **Place Mark > At Cursor**.

2. Left-click the mouse at the desired location on the radar screen. The mark is placed using the default symbol.

To place a mark symbol at the current vessel location:

1. On the Pathfinder Panel, click the **MARKS** button, then click the **Wpt at Vessel**.
   or
   Press the right mouse button and select **Place Mark > At Vessel**.

2. The mark is placed using the default symbol.

   If the Mark database is full, a warning message is displayed, with the position (in latitude and longitude) of the oldest mark. You have the following options:

   ➤ Click **YES** to replace the old mark with the new mark.

   ➤ Click **NO** to keep the old mark and display the next oldest mark. You can keep pressing NO to step through the mark database until a mark you wish to replace is displayed, and then press YES.

   ➤ Click **CLEAR** to keep all the existing marks, and cancel the new mark placement.

To remove marks:

1. On the Pathfinder Panel, click **MENU**.

2. Click **Clear Marks**.

Introduction to MARPA

The hsb^2 Series displays include a Mini Automatic Radar Plotting Aid (MARPA) function for target tracking and risk analysis. MARPA improves the standard of collision avoidance by obtaining detailed information for several automatically tracked targets. MARPA provides continuous, accurate, and rapid situation evaluation.

You can acquire up to ten targets, which are then automatically tracked by the MARPA system. MARPA calculates target bearing and range, true speed and course, CPA (Closest Point of Approach), and TCPA (Time to Closest Point of Approach).

Each tracked target can be displayed with a vector depicting approximate target speed (vector length) and course (vector direction). The target data can be shown on the screen, each target is continually assessed, and you are warned if one becomes dangerous or is lost.

Effective MARPA operation is dependent on accurate own ships heading, plus SOG and COG. The better the quality of the heading data, the better MARPA will perform. (MARPA functions without SOG and COG data but only relative vector, CPA and TCPA are shown; target course and speed cannot be calculated).

Safety Notices

MARPA can improve collision avoidance when used wisely. It is the users' responsibility to use common sense in navigational judgments.

There are conditions where acquiring a target may become difficult. These same conditions may be a factor in successfully tracking a target. Some of the conditions are:

- The target echo is weak.

- The target is very close to land, buoys or other large targets.

- The target or your own ship is making rapid maneuvers.

- Choppy sea state conditions exist and the target is buried in excessive sea clutter or in deep swells.

- Choppy sea state conditions exist yielding poor stability; own ship's heading data is very unstable.

- Inadequate heading data is available.

Symptoms of such conditions are that acquisition is difficult and the MARPA vectors are unstable; the symbol wanders away from the target, locks onto another target or changes to a lost target symbol. If any of these conditions are present, acquisition and tracking may need to be re-initiated or, in some cases be impossible to maintain. Improving the quality of the heading data will reduce the effect of the other conditions.

Risk Assessment

Each target is monitored to see if it will be within a certain distance from your own vessel within a certain time. If so, the target is designated as dangerous and you are warned with an audible alarm in addition to a warning on the screen. The target symbol changes and flashes to indicate that it is a dangerous target. Pressing any key silences the alarm and removes the warning, but the target symbol remains dangerous.

Both the distance (Own Vessel Safe Zone) and the time (Time to Safe Zone) are selectable.

If a target is lost, either because the MARPA software has lost contact with it, or because it has moved out of range, you are warned, again with an audible alarm and an on-screen warning. Pressing any key silences the alarm, removes the warning and removes the lost target symbol from the screen.

Target Data

All MARPA targets are stored in a MARPA database list, which shows bearing, range, course and speed of each tracked target.

For any one target a pop-up data box can be placed on the screen, this shows bearing, range, course, speed, CPA (Closest Point of Approach) and TCPA (Time to Closest Point of Approach). The target for which data is displayed is indicated by a circle around its symbol.

As shown in Figure 5-9, each target is displayed as a symbol to indicate its status, dangerous and lost symbols are shown flashing:

Figure 5-9. Radar Target Symbol Key

Target Vector and History

The MARPA targets can be displayed with a vector line showing where they will be at a certain time in the future, (assuming present course and speed). You can select a relative or true vector and the vector length.

You can also select to view the targets history, this appears as a series of dots that are dropped by the target as it makes way. The interval between them is selectable.

A *relative vector* indicates the targets motion related to your own ships motion. The targets relative course and speed are calculated to produce a vector that is displayed on the target only. This mode is used for collision avoidance and threat assessment.

A *true vector* indicates the targets motion over ground. In this mode true vectors for the target and your own ship are displayed. MARPA measures the direction in which the target and own ship are actually moving over the ground. The result is the vessels *true course*, the rate of motion is the vessels *true speed*. Consider this motion as if you were in a helicopter looking down watching the targets move across the water. This mode can aid navigation.

Radar Range Scales

MARPA target acquisition is only available at radar range scales of up to 12nm, although tracking continues at all ranges. If you change to a lower range scale, targets may be beyond the range of the scanner and will be lost.

Acquiring a MARPA Target

The MARPA functions are accessed through the MARPA default soft key, and some options are available using the right mouse button.

To acquire a MARPA target:

1. Double-click the left mouse button over the target.

   or

1. Click **MENU** on the Pathfinder Panel Toolbar and select **MARPA Set Up**. The MARPA Box appears.

2. Click **Acquire Target** in the MARPA Box.

3. Position the cursor over the required target and click the left mouse button.

   or

1. Click the **Marpa** button on the Radar Functionbar.

2. Click the **Acquire Target** button.

3. Position the cursor over the required target and click the left mouse button.

The ☐ symbol is placed at the cursor position and the radar searches for a target at the cursor position. If a target is present for several scans, the radar locks onto it and the safe target symbol ◯ appears.

If the target is continuously lost, the lost target symbol ◇ is displayed.

Deleting a MARPA Target

To remove a target from the Marpa database:

1. Click **MARPA** on the Functionbar.

2. Click **MARPA List**. The Marpa database is displayed.

3. Select a target from the list, and then click **Delete** to remove the selected target.

or

1. Click the right mouse button.

2. Select **MARPA > Clear**.

3. Click the left mouse button on the selected target to remove it from the screen.

Using the MARPA Dialog Box

The MARPA dialog box (Figure 5-10) displays setup information and data specific to the individual targets. You can also acquire, delete, and display a list of targets, and you can toggle the MARPA dialog box on/off using the **Marpa/MARPA Box: On/Off** button.
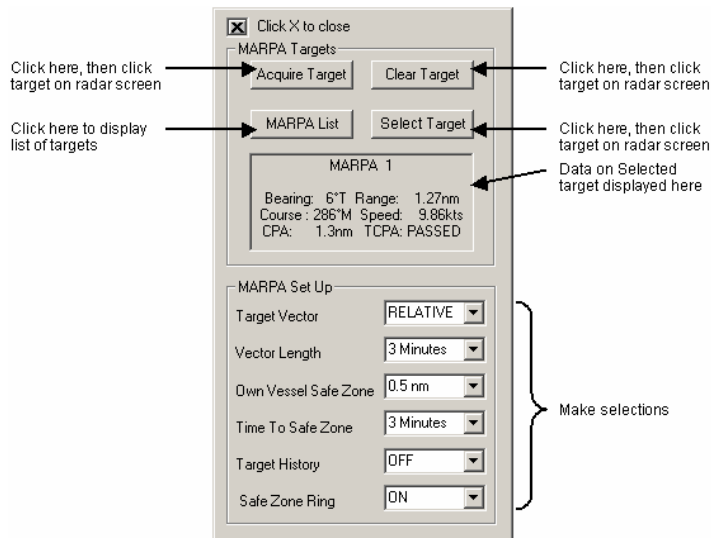
Figure 5-10. Radar MARPA Dialog Box

To acquire a target:

1. Click **Acquire Target** in the MARPA Box. The cursor is displayed with arrows on all four corners.

2. Position the cursor over the required target and click the left mouse button.

To clear a target:

1. Click **Clear Target** in the MARPA box. The cursor is displayed with arrows on all four corners.

2. Position the cursor over the required target and click the left mouse button.

To view target data the MARPA List:

1. Click **MARPA List** in the MARPA box. The MARPA List box appears, displaying Bearing, Range, Course, and Speed of each target.

To view selected target data in the MARPA box:

1. Click **MARPA Box** in the MARPA box. The cursor is displayed with arrows on all four corners.

2. Left-click the target on the radar screen. Data for the selected MARPA target is displayed. If you open the data box when no target is selected, data appears for the last target displayed.

3. Click **Marpa > MARPA Box > On/Off** again to toggle the data box off.

Using Sonar With Navigator

Data from your hsb^2 Series Fishfinder can transferred and displayed (repeated) in a separate Navigator window. The hsb^2 Series Fishfinders use sound waves (sonar) to find fish and show the bottom of a lake or sea. The transducer sends high-frequency sound waves down into the water; these sound waves strike fish, the bottom, or other objects in the water and return as echoes. The Fishfinder interprets these echoes to present an image of the fish and bottom.

The strength of echoes is indicated by different colors. You can use this information to determine the size of fish and the bottom structure. Other objects in the water, such as debris and air bubbles, also return echoes; these echoes are generally weaker than the fish or bottom echoes and produce background noise or *clutter* on the display.

Navigator provides controls to reduce the background noise and to adjust the way in which echoes of different strengths are displayed and let you select the background color and remove the display colors for weaker echoes. There is also a White Line feature which helps to distinguish between the bottom and fish (or other items such as weed) that are close to the bottom.

Connection is made from the hsb^2 output via a special cable that inputs to a PCMCIA card in your PC.

To display sonar data in a separate Navigator window:

1. Make sure the Fishfinder is operational and correctly connected to the RayTech Navigator PC.

2. Power-on the Fishfinder unit.

3. Click **File/Open**, then double-click the **Sonar** icon.

4. The sonar window opens, displaying Fishfinder data over hsb^2.

Pathfinder Panel for Sonar

The Pathfinder Panel is a special toolbar that simulates the functions of the buttons of the hsb^2 Series Radar and Fishfinder display units. When one of the buttons are pressed, the associated function buttons appear in the Sonar Functionbar. You can access the Pathfinder Panel from either the View Menu or the Toolbars button on the Standard toolbar.

When the Sonar window is active, the Pathfinder Panel Toolbar buttons display the following:

- **GAIN** – GAIN Sonar Functionbar buttons

- **VRM/EBL** – VRM/EBL buttons

- **MULTI** – Power Mode, Background Color, and White Line Sonar Functionbar buttons.

- **ALARMS** – Alarms Sonar Functionbar buttons.

- **DISPLAY** –Open Window dialog box

- **MARKS** –Waypoint Mark Sonar Functionbar buttons

- **RANGE** – increases/decreases Sonar viewing range

- **ENTER** – previous Sonar Functionbar menu level

- **CLEAR** – previous Sonar Functionbar menu level

- **MENU** – System Setup, Clear Marks, EBL, and MARPA Setup Sonar Functionbar buttons

- **POWER** – no effect.

Fish Indications

When the Fishfinder detects a fish, it displays an arch-shaped mark. In general, a larger arch indicates a larger fish, though this is not always true. For example, if there are two fish of the same size: one is close to the surface, the other is near the bottom. The fish that is close to the surface has a larger arch because, being closer, more sound waves are returned to the Fishfinder.

The sound waves are actually reflected by an air sac near the center of the fish, not by the body of the fish. The size of this air sac is different for different kinds of fish and this can affect the size of fish arches on the image. A fish with a large air sac produces a large fish arch, while a fish with a small sac produces a small arch. Several arches together show a school of fish. Figure 5-11 shows some example target images.

To display the depth of the fish:

1. Click **MENU** on the Pathfinder Panel

2. Click **TARGET DEPTH ID**.

An arch-shaped image indicates a fish.

The same fish appears differently when shown by the 50 kHz or 200 kHz transducer beams.

50 kHz

200 kHz

A shallow arch is generated when the the boat is moving slowly.

This indicates a group of small fish.

A fish moving under a stopped boat shows as a line.

When the boat is moving very fast, a fish appears as two parallel lines.
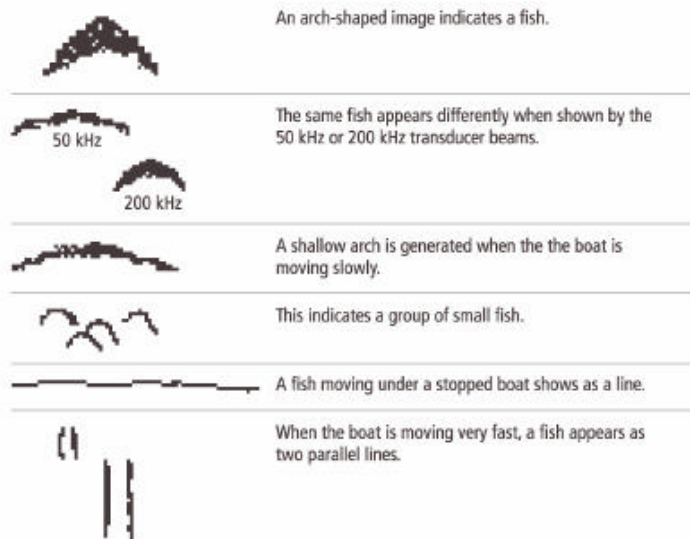
Figure 5-11. Sonar Target Image Key

Effect of Frequency and Boat Speed

The return from a fish has a different appearance depending on the frequency used: 50kHz produces a wide beam, so a fish spotted by this frequency gives a broad arch; the 200 kHz beam is narrower so the same fish produces a narrower arch.

The shape of the arch is also affected by the speed of the boat. If the boat is moving slowly, the arches tend to be longer; if the boat is moving more quickly, the arches are short and peaked. If the boat is moving very fast, a fish may be indicated by a single vertical line.

In Bottom lock mode the fish arches may appear distorted as the bottom topography is removed from the image.

Bottom Indications

The bottom usually produces a strong echo, so it is easy for the Fishfinder to see a lot of detail. The Fishfinder can indicate many different kinds of bottom conditions, as shown in Figure 5-12.

A hard bottom appears as a thin line. An uneven bottom which is covered with rocks or coral produces a complex display; the bottom image is irregular, with long *tails* pointing upward. A wreck produces a similar image.

A softer bottom or a bottom covered with seaweed produces a wide line, as the sound waves reflect from different layers of the bottom. In Figure 5-12, the Fishfinder is getting a good echo from the bottom, so the upper layer of the bottom is shown as dark gray.

Notice that the lower layer of the bottom is shown as a lighter gray, this indicates a weaker echo. This could mean that the upper layer is soft; some sound waves may get through this layer and be reflected as a more solid layer below.

It is also possible that the sound waves are making two complete trips — hitting the bottom, bouncing off the boat, then reflecting off the bottom again; this can happen if the water is shallow, the bottom is hard, or gain is set high.
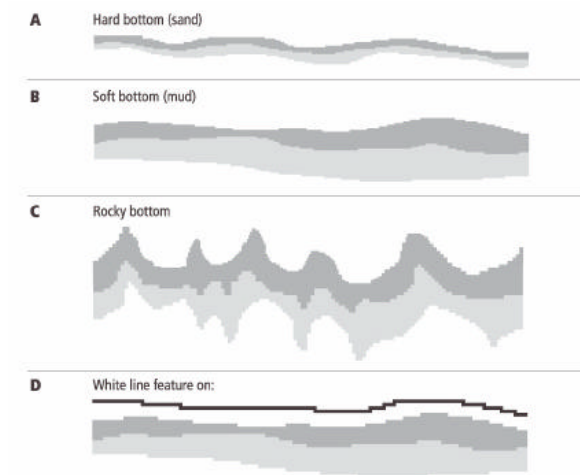
Figure 5-12. Sonar Target Bottom Indicators

Depth Target ID

You can select whether or not the depth appears for displayed fish echoes. When Target Depth ID is set to ON, the depth is displayed just above each fish echo. When set to OFF, the depth of each echo is not displayed.

To toggle on and off the Target Depth ID

1. Click **MENU** on the Pathfinder Panel.

2. Click the **Target Depth ID** button to toggle on/off.

Selecting the Background Color

The background color you select for the primary Sonar window is used on all the Sonar windows (scrolling bottom, Zoom, Bottom Lock and A-Scope).

You will probably find that you need to change the background color in different light conditions. For example, a white background is probably easiest to see in bright sunlight, but a black background may be preferable at night.

To change the background color:

1. On the Pathfinder Panel, click the **MULTI** button.

2. Click **Background Color**. The background color buttons are displayed below a pallet of available colors. The currently selected color is highlighted.

3. Select the desired new color and click **OK**. The background color changes.

4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Changing the Scroll Speed

The standard Fishfinder display is the scrolling bottom image, which shows a graphical representation of the echoes seen by the Fishfinder. New information appears at the right hand side of the display and scrolls to the left.

The speed at which the display scrolls is adjustable, but the same section of the bottom is displayed regardless of scrolling speed. If you select a faster scroll speed, more detail is displayed (useful when you are looking for fish). If you select a slower speed the information moves by more slowly.

The Fishfinder automatically adjusts the scroll speed, based on depth. You also can manually adjust the speed.

If you select automatic adjustment, the scroll speed relates to boat speed as follows:

- Less than, or equal to 0.5 kn, scroll speed is constant at 10%
- Between 0.5–15 kn, scroll speed varies linearly with boat speed
- Greater than 15 kn, scroll speed is constant at 100%

If you select manual adjustment, the scroll speed is not related to the speed of the boat over the bottom. You can also pause the display (the depth indication continues update).

To change the scrolling speed:

1. Click **MENU** on the Pathfinder Panel.
2. Click **Scroll Speed**. Two new buttons are displayed.
3. Click the **Scroll Speed** button that appeared. A popup dialog appears.
4. Press the large **SCROLL SPEED** button to toggle the setting between **AUTO** and **MAN**.
5. For manual adjustment, use the arrows to increase or decrease the scroll speed.
6. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

To pause the scrolling display:

1. Click **MENU** on the Pathfinder Panel.
2. Click **Scroll Speed**. The display stops scrolling and the key is relabeled **Resume Scroll**.
3. To resume scrolling, click **Resume Scroll** soft key. The button is then relabeled **Pause Scroll**.
4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Adjusting the Range Control

The Fishfinder automatically adjusts the display range. Alternatively, the RANGE key lets you select the maximum depth displayed on the scrolling bottom and A-Scope displays. You can also set the shift value to move the image window up or down within the current range.

If you select automatic range adjustment, the Fishfinder selects the shallowest range that still keeps the bottom in the lower half of the display window. When auto-range is selected, shift is disabled (the value is ignored).

To adjust the range and shift values:

1. On the Pathfinder Panel, click **RANGE**. This sets adjustment to manual and the range buttons are displayed.

2. Click **RANGE** key to adjust the range as follows: click the up arrow to select a shallower range, click the down arrow to select a deeper range.

3. To adjust the shift, press the appropriate **SHIFT** soft button: click the UP button to select a shallower shift, click the DOWN button to select a deeper shift. The image window is shifted by the selected amount.

4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Selecting the Power Setting

The POWER MODE Functionbar button allows adjustment of the transducer signal. When AUTO is selected (default), the Fishfinder automatically determines the power setting based on the current depth. LO power (10 W) is used in depth ranges less than 20 feet and HI power (600 or 1000 W, depending on your transducer) is selected for depths greater than 20 feet. When AUTO is selected the current automatic power setting is indicated in the top status line by an L (low) or H (high). If you want to manually adjust the power to suit current conditions, you can select either LO or HI power. The power setting is retained when the unit is powered off.

To change the power setting:

1. On the Pathfinder Panel, click **MULTI** to display the associated Functionbar buttons.

2. Click **Power Mode**. A drop-down menu appears.

3. Click to choose between **AUTO**, **LOW**, or **HIGH** power. The selected setting is highlighted.

4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Selecting the Frequency

The hsb^2 Series Fishfinders use dual frequency sonar. The two frequencies used are 50 kHz and 200 kHz. The Fishfinder automatically selects the appropriate frequency. Alternatively, you can manually select either frequency, or both frequencies simultaneously. Each is suitable for a particular purpose:

50 kHz Frequency – When using this frequency, the transducer scans a wide area. The 50 kHz signal penetrates water well, and is good for use in deep water.

200 kHz Frequency – When using this frequency, the transducer scans a narrower area, but produces a more detailed view. The 200 kHz signal is good for finding fish near the bottom or close together, and is better suited for use in shallow water.

Split Frequency – The transducer can operate in both 50 kHz and 200 kHz frequencies at the same time. If you choose split frequency operation, the scrolling bottom display is split horizontally; the upper half shows the 200 kHz detailed view and the lower half shows the 50 kHz image. You can also choose the split frequency display with the Fishfinder display options: Bottom Lock, A-Scope, or Zoom.

To change the frequency:

1. From the Functionbar's top-level menu, click **Frequency**.

2. Click **50 KHz**, **200 KHz** or **Split**. The scrolling bottom is displayed in the selected frequency. If you choose split, the scrolling bottom is dis-played in both frequencies with 200 kHz in the upper and 50 kHz in the lower window.

3. If necessary, click **Frequency/Auto** to toggle between automatic and manual frequency selection.

4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Adjusting Display Gain (Sensitivity)

The Gain, or sensitivity, of the display adjusts background noise by varying echo strength for display. The value of the GAIN control determines the strength above which echoes are displayed: If the Gain is low only the strongest echoes are displayed; as the gain is increased more, but weaker echoes (from, say air bubbles) are displayed.

The display Gain should be set high enough to see fish and bottom detail, but without too much background noise. Generally, a high gain is used in deep/clear water; a low gain in shallow/murky water.

The Fishfinder provides automatic or manual Gain adjustment. Automatic adjustment is based on depth and water conditions. As conditions change the auto-gain adjusts to display fish with a minimum of background noise. You can manually add a bias to the auto-gain setting. If you select manual adjustment, you will need to re-adjust the Gain as conditions change.

To adjust the Gain:

1. On the Pathfinder Panel, click **GAIN**. The Gain function buttons appear.
2. Click the Gain button for the appropriate frequency: **50KHz** or **200KHz**.
3. Click the large button to toggle between Auto or Manual Gain.
4. Click the arrow keys to adjust the level.

Adjusting Color Gain

The Color Gain determines how echoes of different strengths are displayed. Seven colors per palette are available and the echo strengths are divided into seven bands to correspond with each shade of color.

The Color Gain control sets the lower limit for the top color band:
 All echoes with a signal strength above this value are displayed in the strongest shade/color. All echoes weaker than this value are divided equally between the remaining shades/colors.

Setting a low value produces small band for the strongest color, but a wide signal band for the other colors; setting a high value gives a wide band for the strongest color, but a small signal band for the other colors.

The Fishfinder also provides automatic or manual Color Gain adjustment. Automatic adjustment displays colors based on current conditions, with as many colors as possible, while minimizing noise and clutter. As conditions change the auto-color gain adjusts. You can manually add bias to the auto-color gain settings. If you select manual adjustment, you will need to re-adjust the gain as conditions change.

To adjust the Color Gain:

1. On the Pathfinder Panel, click **GAIN**.
2. Click the Gain control for the appropriate frequency: **50KHz Color Gain** or **200KHz Color Gain**.
3. Click the large button to toggle between Auto or Manual Gain.
4. Click the arrow keys to adjust the level.

Using the A-Scope

The scrolling bottom display provides a historical record of sonar echoes. A-Scope displays a real-time image of the bottom structure and fish directly below the transducer, alongside the scrolling bottom display. At the lower end of the window, A-Scope also displays the patented Bottom Coverage width indication.

To display the A-Scope image:

1. From the top-level Functionbar menu, click **A-Scope**.

2. Click **A-Scope Mode**. A drop-down menu appears.

3. From the drop-down menu, select one of the three modes for A-Scope:

   ➢ Mode 1 – the A-Scope image is angled outward as the signal width (indicated with dotted lines) increases with depth.

   ➢ Mode 2 – the image expands to take up the entire A-Scope window, providing greater resolution.

   ➢ Mode 3 – the left-hand side of the image displayed in Mode 2 expands to the entire A-Scope window. This mode provides the greatest resolution.

4. Click the **A-Scope: ON/OFF** to toggle the A-Scope on. The display is split vertically, with the A-Scope image in the right hand window and the scrolling bottom image in the left hand window.

> **Note:** If the Bottom Lock or Zoom image is displayed, selecting A-Scope automatically switches off Bottom Lock or Zoom. If you have split frequency selected, the A-Scope image is displayed in both frequency windows.

To remove the A-Scope image:

1. Click **A-Scope**.

2. Click **A-Scope: ON/OFF** to toggle A-Scope off.

3. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Using Bottom Lock

The scrolling bottom display provides a *top-down* view, referenced from the surface of the water. Bottom Lock shows a water column of fixed height, referenced from the bottom, that appears flat. It removes bottom detail to provide an image of objects directly above the bottom, and is useful when you are looking for fish that feed close to the bottom.

You can select the Bottom Lock image to be vertically split with the scrolling bottom display, or it can replace the scrolling bottom display. The bottom is shown as a straight line. Notice that some bottom features may extend above this line. The actual depth reading is given in the bottom left hand corner of the Bottom Lock display.

Range intervals on Bottom Lock are measured up from the bottom (rather than down from the surface). Thus, the bottom is shown as zero and the top number indicates the maximum distance above the bottom being displayed. You can adjust the Bottom Lock range.

If the A-Scope or Zoom image is displayed, selecting Bottom Lock automatically switches off A-Scope or Zoom. If split frequency selected, the Bottom Lock image is displayed in both frequency windows. If Target Depth ID is on, the target depth is displayed as distance from the bottom.

To display the Bottom Lock image:

1. Click **Bottom Lock**.

2. Click **Bottom Lock: ON/OFF** to toggle the function on.

3. Click **Bottom Lock: Full/Split** to toggle between a full window bottom lock image or split windows. The bottom lock image is displayed.

    If you select split windows, the Fishfinder display is split vertically, with the bot-tom lock image in the left hand window and the scrolling bottom display in the right-hand window. In a split window display, a vertical bar appears referencing the range displayed in the bottom lock window, and varies in height as the bottom lock range changes.

4. To adjust the range, click **BL Range Down** to select a smaller range, **BL Range Up** to select a larger range.

5. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

Using the White Line

The White Line feature separates echoes from fish near the bottom and the bottom itself. When White Line is switched on, the Fishfinder displays echoes differently. The strongest echoes display in the background color with a thin line on top. All other echoes remain unchanged.

To switch the white line feature on and off:

1. On the Pathfinder Panel, click **MULTI**, the **White Line** button is displayed.

2. Click **White Line** button to toggle the white line On/Off.

Using Zoom

Zoom enlarges all or part of the scrolling bottom display. You can select automatic zoom so the Fishfinder selects a zoom level that keeps the bottom in the lower half of the display window. Alternatively, you can manually pick the area to zoom.

To use zoom:

1. From the top-level Functionbar menu, click **Zoom**.

2. If necessary, click **Zoom: On/Off** to toggle zoom on.

3. Click **Zoom: Full/Split** to toggle between a full window zoom image or split windows.

   If you select split windows, the display is split vertically, with the zoom image in the left-hand window and the scrolling bottom display in the right-hand window. In a split window display, a vertical bar appears (along the right hand edge of the scrolling bottom image) that references the range being displayed in the zoom window. This bar varies in height with the selected zoom level.

4. If necessary, click **Zoom: Man/Auto** to toggle the setting between manual and automatic. The manual setting allows you to reposition the zoomed image.

5. For zoom level selection, click the **ZoomX** to select from **2x**, **4x**, or **6x** zooms levels.

6. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

If the Bottom Lock or A-Scope image is displayed, selecting Zoom automatically switches Off Bottom Lock or A-Scope. If you have split frequency selected, the selected Zoom image is displayed in both frequency windows.

Using Alarms

The **ALARMS** Functionbar button is used to set up alarms: three alarms are available to alert you to the presence of fish, shallow water, and deep water. Each alarm can be toggled On/Off, and you can set the depth at which shallow and deep water alarms are triggered (between the ranges 2–3000 feet/0.5–500 fathoms/1–1000 meters).

You may want to use the shallow and deep water alarms when you are anchored. Set the limits to just above and below your anchor depth; the Fishfinder triggers an alarm if the anchor drags and the boats moves into shallower or deeper water.

- **Fish Alarm** – If this alarm is On, the unit sounds a buzzer whenever it finds a fish.

- **Shallow water** – You set depth at which the shallow water alarm triggers. When the depth is less than that set, the buzzer sounds and a pop-up window describing the alarm is displayed. You cannot set the shallow alarm to be deeper than the deep alarm.

- **Deep water** – You set depth at which the deep water alarm triggers. When the depth is more than that set, the buzzer sounds and a pop-up window describing the alarm is displayed. You cannot set the deep alarm to be shallower than the shallow alarm.

To set an alarm:

1. On the Pathfinder Panel, click **ALARMS**.

2. Click the button for the desired alarm:

   For the Fish Alarm, click **FISH ALARM** to toggle the alarm On/Off.

   For the Shallow Alarm or Deep Alarm, click **SHALLOW ALARM** or **DEEP ALARM** soft key to display two new Functionbar keys.

3. Press the **ALARM** to toggle the alarm On/Off, then press the **ALARM DEPTH** and use the up/down arrows to change the alarm limit.

4. Click **ENTER**, **CLEAR**, or **BACK** to return to the top-level Functionbar menu.

To silence an alarm and clear the alarm message, press any key.

Using VRM

The VRM (variable range marker) key is used on the Fishfinder to determine the depth and distance-behind-boat of an object on the display. The VRM function is available on the scrolling Fishfinder display, bottom lock and zoom windows.

A VRM is displayed as a cross hair with height and width of the display window. The center of the crosshair is the reference for which depth and distance-behind-boat are displayed. You can use the cursor to move the VRM over a particular object.

Depth is displayed (in system units) on the VRM. In the scrolling Fishfinder and Zoom windows, depth is measured from the surface down. In the Bottom Lock window, depth is measured from the bottom up.

Distance-behind-boat is displayed next to the vertical line, at the top of the window. The VRM distance units correspond to the depth units assigned in System Set Up as follows:

System Depth Unit	VRM Distance Unit
Meters	Meters
Feet	Feet
Fathoms	Fathoms

The distance-from-boat continues to update as your boat moves. However, the vertical line does not scroll with the scrolling Fishfinder image. If the display range changes, the VRM maintains the same position and may, therefore, move out of the visible display area. When you switch on the VRM, it is displayed at its last position (unless off screen, then it is displayed on-screen).

If the Fishfinder is in split frequency display mode or a zoom window is displayed with the scrolling Fishfinder image, then the VRM is shown in both windows at the same position.

To use the VRM:

1. On the Pathfinder Panel, click **VRM/EBL**.

2. Click **Show VRM/EBL** to toggle the VRM On/Off. When On, the VRM is displayed in its last-used position, as a dashed-line crosshair.

3. Click **Edit VRM/EBL**. The crosshair becomes solid, indicating that you can now move the VRM.

4. Move the cursor over the VRM, then click and hold the right mouse button.

5. While continuing to press the mouse button, drag the VRM to the desired location. The depth and distance-from-boat are updated as you move the cursor.

6. Release the mouse button when ready, and the VRM crosshair returns to a dashed-line.

7. Click **Show VRM/EBL** to toggle the VRM off.

Using Waypoints

The **MARKS** Functionbar button lets you to place up to 998 waypoints. A waypoint is a position, normally entered on a chart as a reference, or as a place to go to. A waypoint can be placed at the cursor position or at the vessel's current position (this is sometimes known as an event mark); all waypoints placed on the Fishfinder are stored in a waypoint database list with position, depth and temperature when it was placed.

Waypoints placed on the Fishfinder are displayed as a solid vertical line on the scrolling bottom, Zoom, and Bottom Lock displays. The waypoint number is shown at the top of the vertical line. The waypoint scrolls to the left with the scrolling bottom display.

If you place a waypoint at the cursor position in Fishfinder mode, and a chart window is open, the waypoint is displayed on the chart. You can GOTO, EDIT, and ERASE a cursor waypoint.

To Place a Waypoint:

1. On the Functionbar, click **MARKS**. Then:

   ➢ To place a waypoint at the cursor position, click **WPT AT CURSOR**, then click the cursor at the desired location on the scrolling bottom display. The waypoint is added to the waypoint list and tagged using the next available number.

   ➢ To place a waypoint at the vessel position, click **WPT AT VESSEL**. The waypoint is added to the waypoint list and tagged with the next available number.

   ➢ To modify a waypoint, click **WPT LIST**. The waypoint list is displayed.

   ➢ To return to the top-level Functionbar menu, click **BACK**.

Using Polars to Optimize Your Performance

This section explains how to use Navigator's Polars plotting functionality to analyze and fine-tune your boat's performance. Intended primarily for the experienced sailor, Polars uses a group of variables (such as apparent/true/corrected wind angles, boat speed, heel/pitch, and so forth) to determine what heading you should set your boat upon to achieve the best possible speed under varying wind conditions. Analysis results are displayed using several graph plots and data matrices, which you can modify (edit) to suit your needs. A typical Polars plot screen is shown in Figure 5-13.
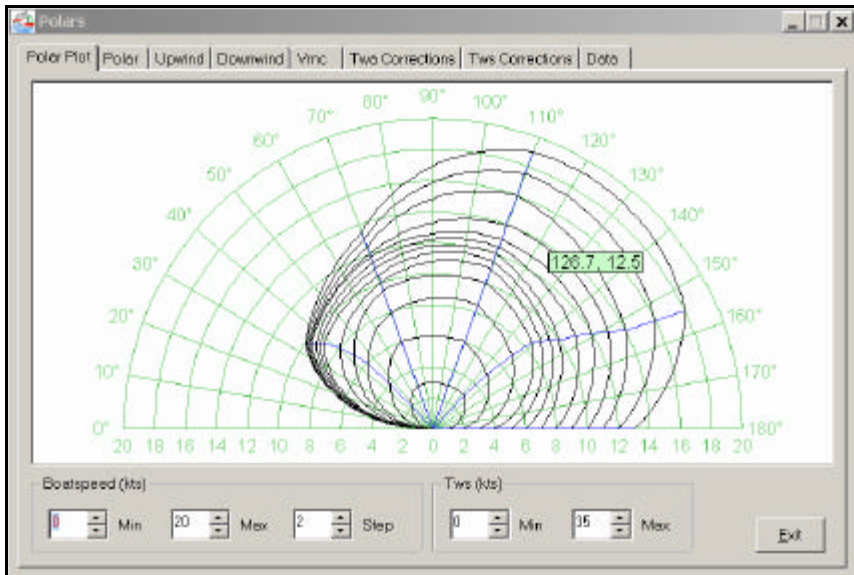
Figure 5-13. Typical Polars Plot Screen

Collecting Data

The accuracy of the analysis presented by Polars depends upon the volume and accuracy of the data collected. There are two primary areas within Polars where you can enter and modify data: the **Polar** tab and the **Data** tab (Figure 5-13). The Polar tab displays the Polar Parameters screen, which contains variables/values used to plot the Polar graph. The Data tab displays the Data Tests screen, which enables the input of advanced, boat/weather performance-related information that you can use to further fine-tune the analysis.

While these screens come pre-loaded with default data, it is essential to replace as much of this information as possible with real performance/ atmospheric-specific data. You can use Navigator's DataTrak and Data Logging utility programs to record a wide variety of performance-related data that is ideal for use with these secreens. Data for these screens can also come from such sources as your boat's manufacturer and local nautical organizations.

Entering and Editing Data

This section explains how to enter data into the Polar Parameters and Data Tests screens, how to the edit individual variables, and how to apply and save your changes.

Polar Parameters Screen

To enter data into the Polar Parameters screen, do the following:

1. On the Polars screen, click the **Polar** tab. The Polar Parameters screen is displayed (Figure 5-14).
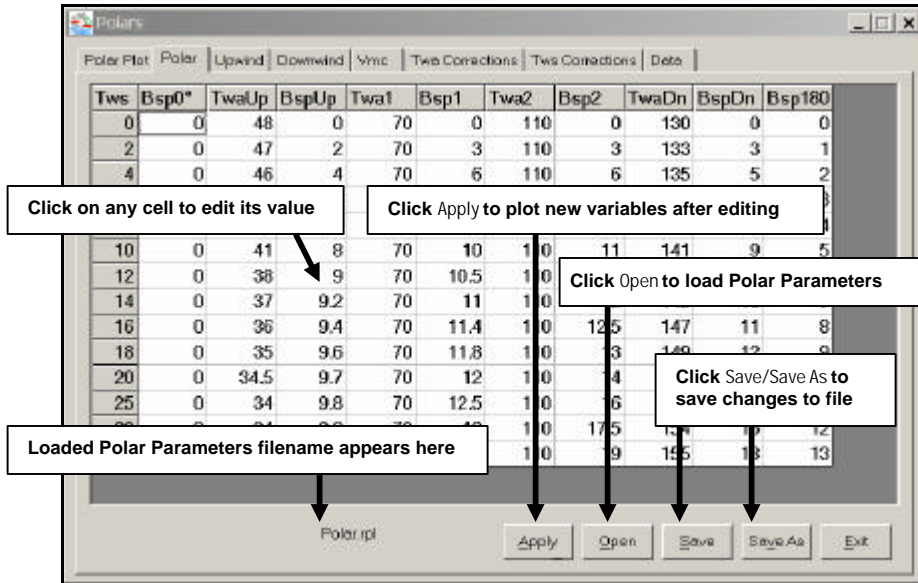
Figure 5-14. Polar Parameters Screen

2. Replace as much of the default data as possible with real data that you've collected. You can modify the default values shown, or you can load an existing Polar Parameters file. To modify the values shown, skip to Step 4. To load an existing Polar Parameters file, click **Open**. The open file dialog box is displayed.

3. Choose the Polar Parameters file (.rpl extension) you want, then click **Open**. The selected file is displayed.

4. To edit individual values, click on the cell you want to change. The value is highlighted. The definitions for the cell names are as follows:

Tws – True wind speed in knots

Bsp0° – Boat speed in knots at zero degrees (sailing directly into the wind)

TwaUp – True wind angle Upwind in degrees

BspUp – Boat speed Upwind in knots

Twa1 – True wind angle in degrees (first variable)

Bsp1 – Boat speed in knots (first variable)

Twa2 – True wind angle in degrees (second variable)

Bsp2 – Boat speed in knots (second variable)

TwaDn – True wind angle Downwind in degrees

BspDn – Boat speed Downwind in knots

Bsp180 – Boat speed in knots at 180 degrees (sailing directly with the wind)

5. Enter a new value, then click outside of the cell. The new value is then accepted. Repeat Steps 4 and 5 for each value you want to change.

6. If you simply want to view your data without saving it, skip to Step 7. Otherwise, when you have finished entering data, click **Save** to save under the current filename, or **Save As** if you want to create/name a new Polar Variables file.

7. Click **Apply** to use the new variables in the Polar plot, then click the **Polar Plot** tab to view the new data graph.

Data Tests Screen

To enter values into the Data Tests screen, do the following:

1. On the Polars screen, click the **Data** tab. The Data Tests screen is displayed (Figure 5-15). This screen initially contains a single row of test data; however, you can store and edit as many different test data rows as you need, each row representing a unique run and its associated performance statistics.
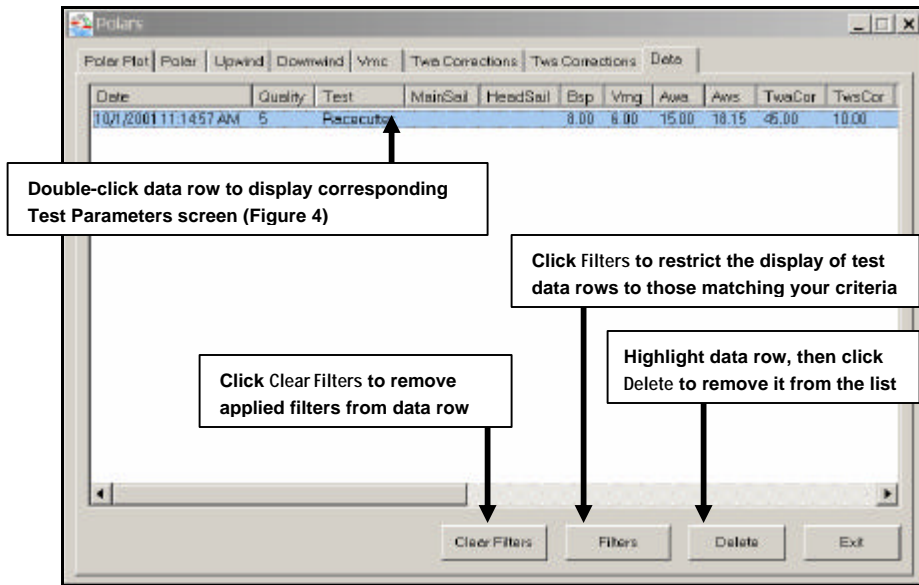
Figure 5-15. Data Tests Screen

2. Double-click on the test data row you want to edit.
    The corresponding Test Parameters screen appears (Figure 5-16). The data that you see in this screen comes from
    Navigator's database, which contains data you've saved from
    various from trips. The parameter definitions are as follows:

    Test – Name you choose for this set of test data.

    Date – Date of test run.

    Quality – Number you assign to represent your
    perception of the quality of the data
    collected in this test
    (from 1 to 100).

    Notes – Your comments about the test data.

    HeadSail – Name/code for type of headsail you're using.

    MainSail – Name/code for type of mainsail you're using.

    Awa – Apparent wind angle, in degrees. The
    angle of wind as measured by your boats
    instruments. When the boat is stationary,
    Awa is equal to Twa (True wind angle).
    When the boat moves, Awa is always less
    than Twa.

    Aws – Apparent wind speed, in knots. The speed
    of the wind as measured by your boats
    instruments. When sailing upwind, Aws is
    always greater than Tws (True wind speed).
    When sailing downwind, Aws is always less
    than Tws.

    Twa – True wind angle, in degrees. The angle
    between Twd (True wind direction) and
    the centerline of the boat.

    Tws – True wind speed, in knots. The velocity of
    the wind relative to the surface of the water.

Twd – True wind direction, in degrees. The magnetic bearing that the wind is coming from, calculated to appear as though measured from a stationary boat.

CorTwa – Corrected True wind angle, in degrees.

CorTws – Corrected True wind speed, in knots.

CorTwd – Corrected True wind direction, in degrees.

Bsp – Boat speed, in knots.

Vmg – Velocity made good, in knots. The Bsp directly toward or away from the Twd, used to measure performance relative to upwind/downwind targets.

Heading – Heading of boat, in degrees.

Heel – Amount of heel, in degrees.

Pitch – Amount of pitch, in degrees.

Rudder – Amount of rudder deflection, in degrees.

Tab – Amount of rudder trim Tab deflection, in degrees. The Tab is an adjustable section of the rudder that allows the rudder to be corrected for lee helm or weather helm.

Butt – Amount of mast butt angle in degrees.

ForestayLength – Length of Forestay Line in feet or meters (your choice). The Forestay Line runs from the bow of the boat to the upper part of the mast and is designed to pull the mast forward.

ForestayStrain –

Set – The direction of the current, in degrees.

Drift – The velocity of the current, in knots.

Figure 5-16. Test Parameters Screen

3. Type your data into the appropriate fields, then click **OK** when you are finished.

4. You can further refine your analysis by using filters to narrow the number of data test rows displayed in the Data Tests screen. The Filters screen (Figure 5-17) enables you display only those tests that fall within the specific criteria you select. For example, you might only want to see tests that were run from October 5th to October 14th 2001. To use filters, click **Filters** on the Data Tests screen. The Filters screen is displayed.
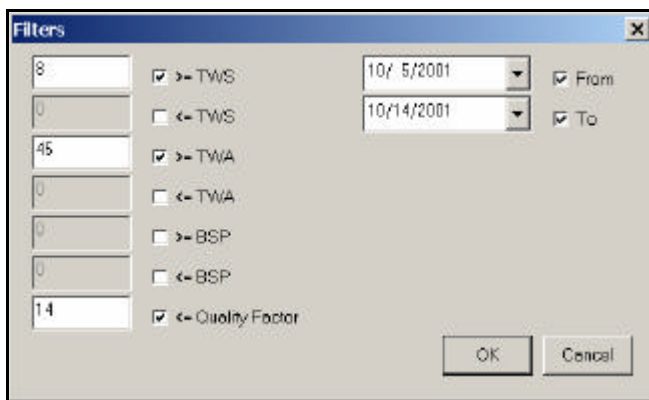
Figure 5-17. Filters Screen

The Filters screen selections sort the data test rows as follows:

> **> = TWS** – Displays only those tests having True Wind Speed greater-than-or-equal-to the value entered.

> **< = TWS** – Displays only those tests having True Wind Speed less-than-or-equal-to the value entered.

> **> = TWA** – Displays only those tests having True Wind Angle greater-than-or-equal-to the value entered.

> **< = TWA** – Displays only those tests having True Wind Angle less-than-or-equal-to the value entered.

> **> = BSP** – Displays only those tests having Boat Speed greater-than-or-equal-to the value entered.

> **< = BSP** – Displays only those tests having Boat Speed less-than-or-equal-to the value entered.

> **< = Quality Factor** – Displays only those tests having a Quality Factor less-than-or-equal-to the value entered.

> **From/To** (dates) – Displays only those tests that correspond to the date(s) entered.

5. After you've made your filter selections, click **OK** to return to the Data testing screen.

How to Graph and Read a Polar Plot

This section lists the basic steps you must perform to graph and read a Polar Plot screen (Figures 5-14 and 5-18). The Polar Plot screen graphs the theoretical headings your boat should take toward specified targets (both upwind and down) when encountering various wind conditions. As discussed earlier, the accuracy of these graphs depends primarily on the volume and accuracy of the boat- and weather-specific information you've entered into the Polar Parameters and Data Tests screens. After you have entered your data, that information is displayed as a polar graph in the Polar Plot screen. Placing the cursor anywhere along the Polar plot yields a small pop-up window that displays the wind angle/boat speed correlation at that point.

To graph a Polar plot, do the following:

1. Enter all requisite data into the Polar Parameters and Data Test screens as described in the previous subsections.

2. Click the **Polar** tab to display the Polar Plot Screen.

3. As shown in Figure 5-18, select the boat speed scale (bottom axis) you want displayed by clicking on the **Boatspeed (kts)** up/down arrows or by entering numbers directly.

4. Select the range of True Wind Speeds to be plotted by clicking on the **Tws (kts)** up/down arrows or by entering numbers directly.

To read a Polar plot, refer to the example in Figure 5-18 and the following plot component definitions:

- The bottom axis shows boat speed range in knots, with the minimum/maximum speed and speed interval determined by you, depending on the scale you want plotted.

- The top axis describes an arc of 180° representing your boat's direction with respect to the wind. At 0° you are sailing directly into the wind, at 180° you are sailing directly with the wind.

- The lines that lie precisely on the 70° and 110° axes (in this example) correspond to the settings of the **Twa1** and **Twa2** variables found within the Polar Parameters screen. These lines are displayed in blue on the screen.

- The lines that diverge between 30° and 50°, and 130° and 160°, represent the correlation between True Wind Angle (Twa) upwind and downwind (respectively) and boat speed. These lines are also displayed in blue on the screen.

- The line that describes a semi-circle (beginning from 0°, 0 Kts on the example plot) plots the optimum heading and resultant speed relative to the True Wind Speed (Tws) range you enter at the bottom of the screen (see Figure 5-18). As you increase the Tws range, additional lines are plotted onto the graph, showing the heading you should take to make optimum progress as wind speed increases. These lines are displayed in black.

- The dot and coordinate-pop-up show the current boat speed and heading, as entered into the Data Test screen. The dot is displayed in red, and will only appear if the value entered can be plotted on the current graph.
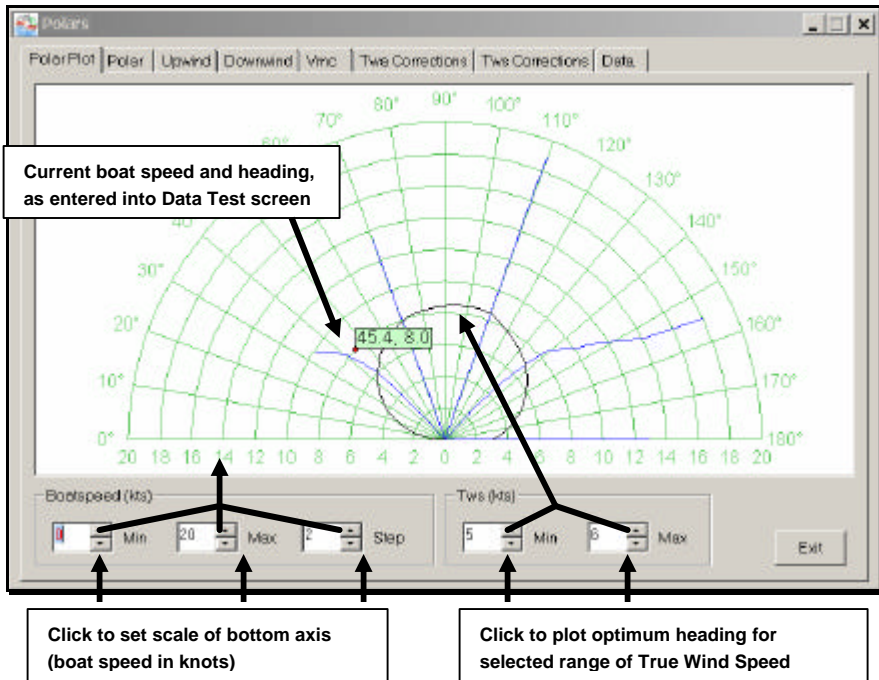
Figure 5-18. Polar Plot Example Screen

Using the Upwind, Downwind, and Vmc Plot Screens

The Upwind, Downwind, and Vmc Plot (Velocity Made good on Course) screens enable you to directly analyze those aspects of the Polar plot by reducing the display content to only those elements.

The Upwind Plot screen (Figure 5-19) calculates the best angle and boat speed when sailing upwind and displays:

- Velocity Made Good relative to True Wind Angle – click **Vmg** to view, then select the True Wind Speed range to plot by clicking on the **Tws (kts)** up/down arrows or by entering numbers directly.

- Boat Speed relative to Tws – click **Bsp** to view.

- True Wind Angle relative to Tws – click **Twa** to view.
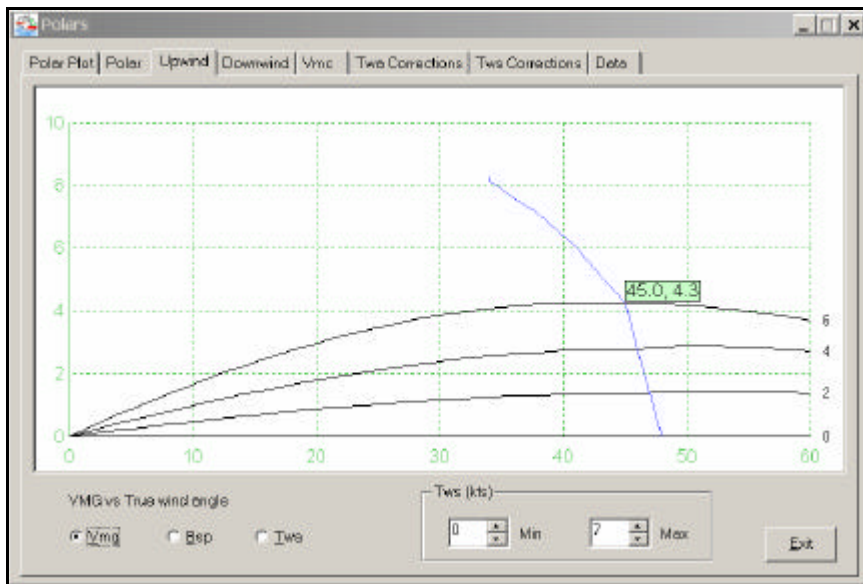
Figure 5-19. Upwind Plot Screen

The Downwind Plot screen (Figure 5-20) calculates the best angle and boat speed when sailing downwind and displays:

- Velocity Made Good relative to True Wind Angle – click **Vmg** to view, then select the True Wind Speed range to plot by clicking on the **Tws (kts)** up/down arrows or by entering numbers directly.

- Boat Speed relative to True Wind Speed – click **Bsp** to view.

- True Wind Angle relative to True Wind Speed – click **Twa** to view.

Figure 5-20. Downwind Plot Screen

The Vmc Plot screen (Figure 5-21) displays the Velocity Made good on Course toward a specific mark or target. Although similar in concept to Vmg, Vmc is equal-to Vmg only when the bearing to the mark and wind direction are identical. Vmc is used when you expect the wind to change between your present position and the target (primarily in long course racing). In such an instance, it may be a smarter tactical move to sail toward your target at the fastest possible speed, even if that heading isn't directly toward the target.

To use the Vmc plot, select the Course and True Wind Direction and True Wind Speed to be plotted by clicking on the **Course, Twd**, and **Tws** up/down arrows or by entering numbers directly. By default, Course and Twd are initially derived from instrument input, but the screen allows you to change these figures to calculate what happens if the wind or course changes.

Figure 5-21. Vmc Plot Screen

Calibrating to Ensure Data Accuracy

The accuracy of the data generated by your instruments and performance evaluation systems depends on accurate calibration. While the following subsection presents an introductory explanation of instrument calibration, you must refer to the manuals that came with your instrumentation systems for the specific calibration procedures.

The subsections that follow explain the calibration methodologies for the following variables:

- Boat speed
- Compass
- Apparent wind angle
- True wind angle
- True wind speed

Boat Speed Calibration

Boat speed calibrations are entered directly into your instrumentation system (refer to your system's manual for the procedure). While it may not be practical to check boat speed calibration on a daily basis, we encourage you to check this variable on a measured mile as often as possible, as the paddle-wheel impellers that generate boat speed data can change their physical characteristics markedly over their lifespan due to the environment in which they operate. When making a measured mile calibration, perform three consecutive runs over the known distance, to eliminate any tidal current effects.

Compass Calibration

Compass calibration involves two procedures: Deviation and Heading Error calibration. Calibrating Deviation corrects compass error around the different points of the compass. Keep in mind that some instrumentation systems have the ability to swing (calibrate) the compass automatically.

Heading Error calibration ensures that the heading the compass indicates always reflects your true heading. Calibration of this kind is usually achieved by piloting the boat along a known line of transit. For best results, you should have your compass professionally swung.

Apparent Wind Angle Calibration

You must perform Apparent Wind Angle calibration after the mast head wand is initially installed on your boat. Since the wand may not lie exactly on the fore and aft line of the boat, Awa calibration is necessary to compensate for this. The Awa should read zero when the vane is on the centerline of the boat. If you don't get a zero reading, you must enter an offset value into the instrumentation system.

The amount of Awa alignment error can be established in two ways:

- Take the boat head-to-wind and read the Awa angle. If the Awa value is not zero, you have a calibration error. This method is less accurate than the following one.

- Perform two or three tacks upwind in even wind strength, then compare the average Awa tack-to-tack by using Navigator's DataTrak utility.

The calibration must be performed under even wind strength, as differing wind strengths will result in different Awa readings tack-to-tack. It is also important to calibrate Awa offset in the absence of wind shear and wind gradient; however, calibration in light air (such as a sea breeze filling in) is not recommended.

Here are some important guidelines for successful Awa offset calibration:

- Choose a day with no wind shear, minimal gradient, and a steady True Wind Speed.

- Ensure that Navigator's DataTrak utility is online and operational.

- Sail upwind at your optimum close-hauled angle.

- Complete four to six tacks in steady wind conditions.

- Use the "wand method" of averaging in the charts to ascertain the difference in Awa on each tack.

Once you have determined the Awa offset, enter it into the Mast head Unit offset parameter within your instrumentation system. Use half the difference between the wind angle on each tack. This keeps the Awa symmetrical tack-to-tack, because Laylines are predicted based upon the Awa.

True Wind Angle Calibration

True Wind Angle must be calibrated because of the way instrumentation systems measure Awa. Since Awa is measured relative to the top of the mast, errors can be introduced by the mast-top twisting under various wind conditions as a result of mainsheet, topmast, and runner loads. Awa calculation accuracy is also affected by air flow over the sails (and would be entirely different in the absence of sails) and by wind shear as discussed in the previous subsection.

To calibrate Twa, begin by performing at least six tacks/gybes each day to correct for Twa and Twd. The simplest way to arrive at a value is to watch the Twd before and after a tack, halve the difference, then add or subtract this value to/from the wind correction table for that wind strength. You can use the Twa Corrections screen (Figure 5-22) within Polars to keep track of these corrections.
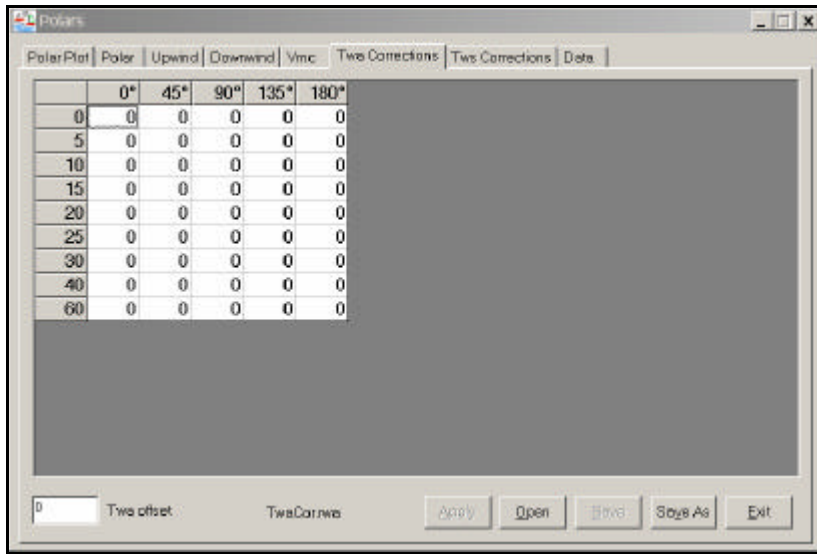
Figure 5-22. Twa Corrections Screen

It's important to note that depending on your instrumentation system's damping, the Twa value can take up to 30 seconds to "settle down" after a tack/gybe. Whether you add or subtract the value depends upon whether the instruments have either lifted or headed during the tack. The same convention applies to a downwind gybe, whereby a lift takes you away from, and a header takes you closer to, the bottom mark. If you apparently get a lift after tacking, you must subtract that correction and add a header correction to the table.

Here's an example of Twa calibration:

After tacking five times, the average wind direction changes 6 degrees tack-to-tack in 10 knots of wind. This has the effect of showing a lift and therefore 3 degrees can be subtracted from the upwind correction table for 10 knots of wind. Keep in mind that some tacks/gybes can yield an incorrect calibration value if the wind has actually shifted, so this must also be factored into the calculation process. Additionally, calculations will be affected if the boat has been set up differently tack-to-tack (such as varying runner loads, more backstay, etc).

True Wind Speed Calibration

True Wind Speed calibration assumes that the True Wind Speed upwind reflects the correct value. However, when sailing downwind, airflow over the masthead unit is affected by the spinnaker. Therefore, downwind Tws must be corrected so that your instruments show the same Tws value upwind and down.

The simplest method to achieve this is to measure wind speed upwind and then calculate an average using the wand method. Once the spinnaker is up and the boat is stable downwind, take another wand method reading and average it. The difference between the two values is the correction to be subtracted in the Tws Corrections screen (Figure 5-23). Enter your corrections into the 180° column for the wind speed you are experiencing.
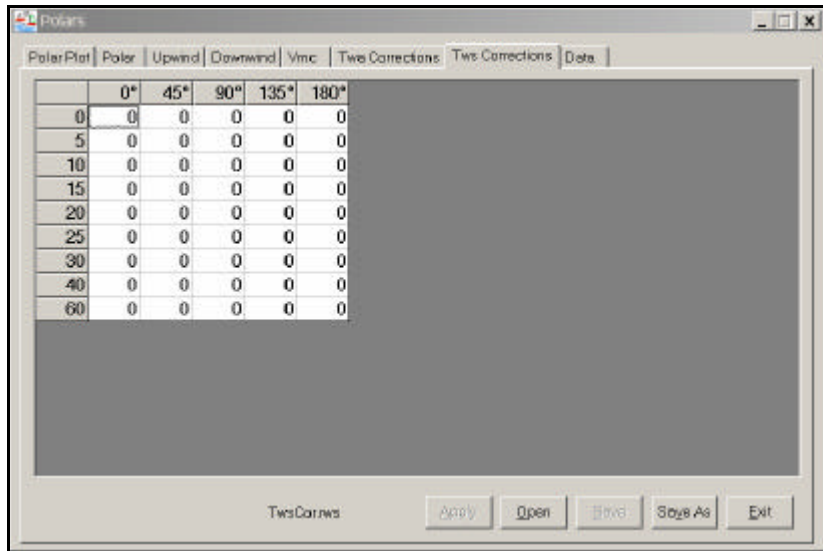
Figure 5-23. Tws Corrections Screen

Using the Engine Instrument Panel

This section explains how to display and configure the engine instrument panel (Figure 5-24). The panel is composed of up to ten gauges, including a tachometer, oil pressure gauge, volt meter, etc. You can select which gauges are displayed and what they show, and you can monitor the operation of up to two onboard engines with two concurrently displayed engine panels. The engine panel can contain some or all of the following components:

- **Tachometer** – Displays engine revolutions up to 1800, 3000, 4000, or 6000 RPM.

- **Battery** – Displays the voltage level of the battery for 12- or 24-volt systems.

- **Turbo** – Displays the turbocharger's boost level in pounds-per-square-inch (PSI) and barometrically (BAR) [range: **2 bar/28 psi** up to **30 bar/435 psi**].

- **Turbo Oil** – Displays the engine turbocharger's oil pressure in PSI and BAR (same ranges as **Turbo**).

- **Engine Oil** – Displays the engine's oil pressure in PSI and BAR (same ranges as **Turbo**).

- **Tank Fuel** – Displays the level of fuel in the fuel tank.

- **Gearbox** – Displays the gearbox oil pressure in PSI and BAR (same ranges as **Turbo**).

- **Air Intake** – Displays the temperature of the air being drawn into the engine's air intake in Fahrenheit/Celsius degrees (range**: 120 C/250 F** up to **150 C/300 F**).

- **Water** – Displays level of water in the reservoir.

- **Total Engine Hours** – Displays the total number of hours the engine has been run since new.

- **Trip Engine Hours** – Displays the number of hours the engine has run on the current outing (can be reset for each trip).
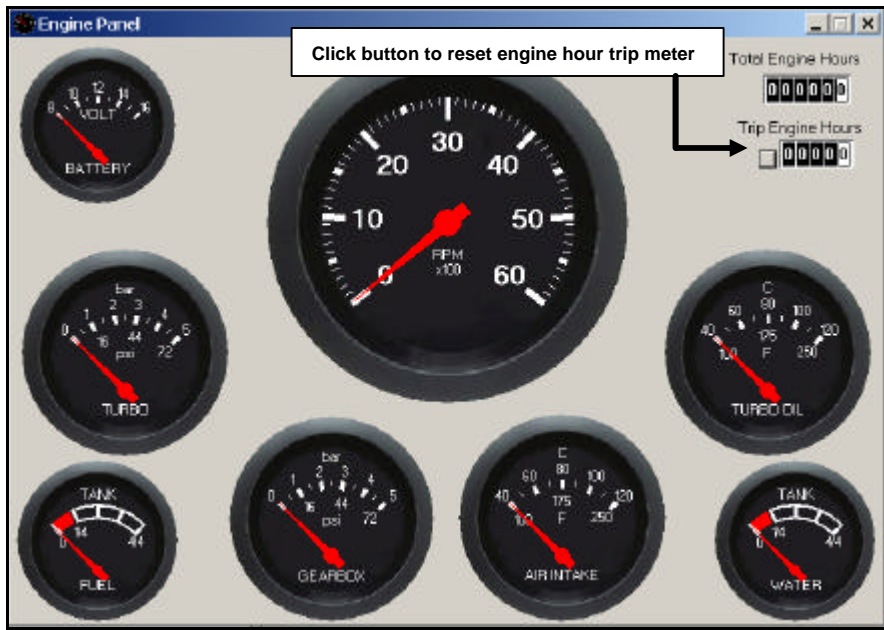
Figure 5-24. Single Engine Instrument Panel with Tachometer

Displaying the Panel

1. From the **File** menu, select **Open**. The Open Window dialog box is displayed.

2. Double-click the **Engine Panel** icon to display the gauges.

Configuring the Panel

Navigator allows you to choose the gauges you want displayed and in most cases, what they display. To configure the panel, perform the following steps:

1. Move the cursor to the title bar of the engine panel and click the right mouse button. From the pop-up menu that appears, select **Settings**. The Engine Panel Settings Screen is displayed (Figure 5-25).
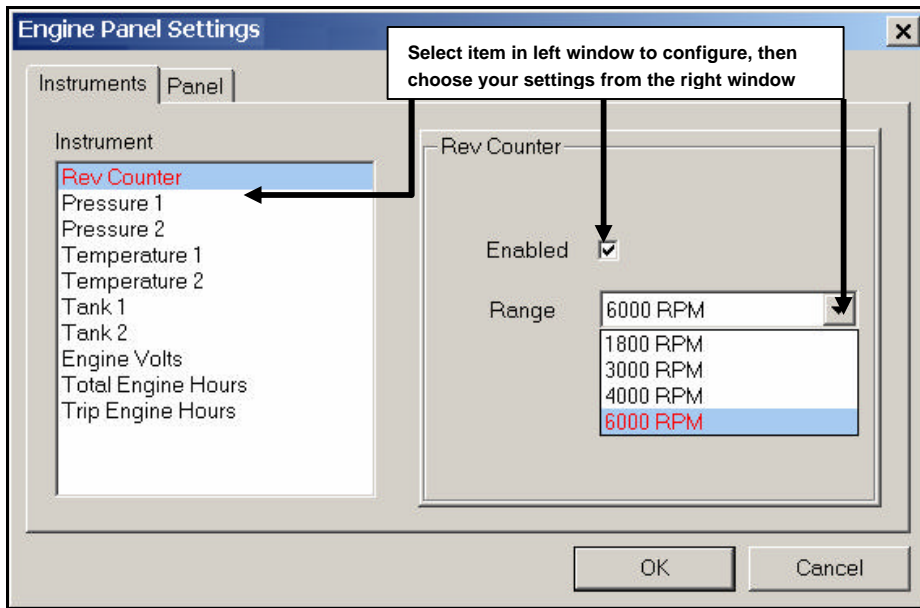
Figure 5-25. Engine Panel Settings Screen Showing Instruments Tab

2. If not already displayed, click the **Instruments** tab. As shown in Figure 5-25, the screen is composed of two halves. The left side contains the available gauge types, while the right side shows the options you can select for a particular gauge.

3. Select a gauge, then decide whether you want the gauge displayed by clicking **Enabled**. Next, select the setting(s) you want that gauge to display. In Figure 5-24, the tachometer has been enabled, and the range has been set to a 6000 RPM maximum.

4. Repeat Step 3 for all gauges you want displayed on the panel.

5. Click the **Panel** tab. As shown in Figure 5-26, the checkboxes on the Panel tab allow you to:

   - Display gauge sets for one or two engines.

   - Set the panel to appear above any other currently displayed Navigator screens if any engine-related alarms are generated.

   - Set the display style of the gauges. If you select **Classic Style Dials**, gauges with white lettering on a black background are displayed. If you leave the checkbox empty, gauges with black lettering on a white background are displayed.

   Click the checkboxes you want, then click **OK**.
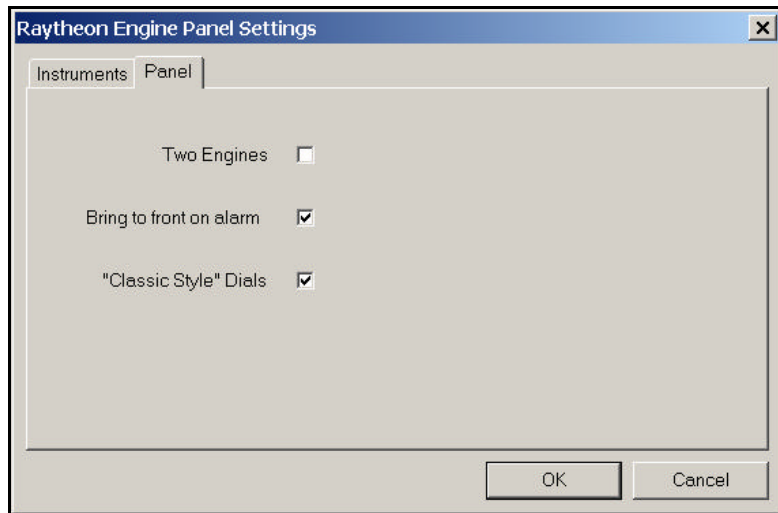
Figure 5-26. Engine Panel Setting Screen Showing Panel Tab

Appendix A
Connecting Peripheral Instruments

Overview

This appendix gives a technically-oriented general explanation of common marine instrument/cabling principles, and then shows you how to connect the various instruments and devices that can interface with RayTech Navigator. These include GPS, radar and sonar, autopilots, and other navigational reporting devices and systems.

Covered in the appendix are:

- Connecting instruments using a standard 9-pin NMEA cable, including cable diagrams and pin-out tables.

- Connecting specific manufacturers' instruments, including cable diagrams and pin-out tables.

- Basic NMEA and RS-232 cabling principles, along with important guidelines to follow when making your connections.

Connecting to Instruments Via an NMEA Cable

This section explains the basics of connecting Navigator to the NMEA leads of a GPS, an NMEA-equipped instrument, radar, and an autopilot. These connections are made using a 9-pin NMEA cable (Figure A-1, Raymarine Part No. E86001), one end of which connects to your PC's COM port, the other to the various devices. In addition to the cable diagram, specific NMEA lead connection assignments are given for each type of device. Further details are also provided later in this appendix, in the section "Connecting Specific Instruments and Devices," which lists some common manufacturers' instruments and explains how to connect them to Navigator. In all cases, you should also refer to the manual that came with the device you are connecting.
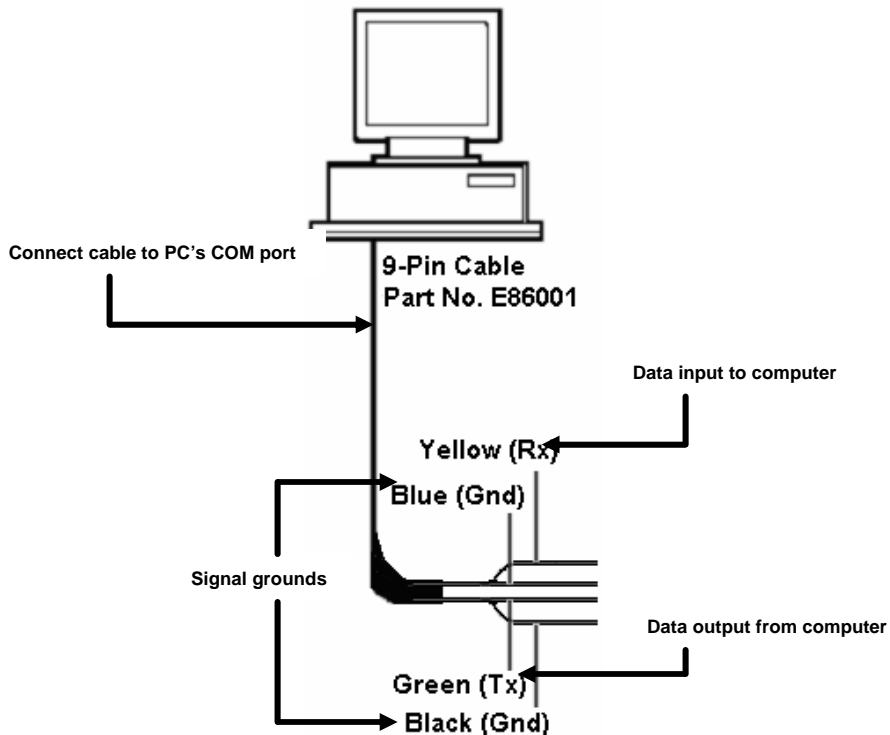
Figure A-1. Raymarine NMEA Connection Cable, Part No. E86001

Connecting Directly to a GPS

When connecting Navigator directly to a GPS system, follow these guidelines:

- Verify that GPS NMEA output is turned on.

- Set the GPS datum to WGS84.

To connect directly to a GPS system, refer to Figure A-1 and Table A-1.

Table A-1. Connecting Navigator Directly to GPS System

Connect Cable Color:	To GPS Lead:
Yellow (*Rx*)	**NMEA + output** (which may also be labeled TX, TX+, Data out+, or NMEA OUT+)
Blue (*SGnd*)	**NMEA - input** (which may also be labeled RX-, Data In -, or NMEA IN-, or Ground)
Green (*Tx*)	**Not used**
Black (*SGnd*)	**NMEA - output** (which may also be labeled TX-, Data Out -, or NMEA OUT-, or Ground)

Connecting Directly to NMEA-Equipped Instruments

Most instrument systems are equipped to accept incoming NMEA data from your GPS, and will output additional collected NMEA data, such as vessel position, heading, speed, water depth, etc.

To connect Navigator directly to an NMEA-equipped instrument system, refer to Figure A-1 and Table A-2.

Table A-2. Connecting Navigator Directly to NMEA-Equipped Instruments

Connect Cable Color:	To NMEA Instrument Lead:
Yellow (*Rx*)	**NMEA + output** (which may also be labeled TX, TX+, Data Out+, or NMEA OUT+)
Blue (*SGnd*)	**NMEA - input** (which may also be labeled RX-, Data In -, or NMEA IN-, or Ground)
Green (*Tx*)	**NMEA + input** (which may also be labeled RX, RX+, Data In+, or NMEA IN+)
Black (*SGnd*)	**NMEA - output** (which may also be labeled TX-, Data Out -, or NMEA OUT-, or Ground)

Connecting Directly to Radar

In order for Navigator to be able to display range rings, cursor information, and electronic bearing lines, the radar system you use must be able to output the NMEA RSD string.

To display MARPA targets, your radar must be able to output NMEA TLL or TTM strings. If you are going to this feature, make sure your radar system is correctly tracking the MARPA targets before connecting it to Navigator.

To connect directly to radar, refer to Figure A-1 and Table A-3.

Table A-3. Connecting Navigator Directly to Radar System

Connect Cable Color:	To Radar Lead:
Yellow (*Rx*)	**NMEA + output** (which may also be labeled TX, TX+, Data Out+, or NMEA OUT+)
Blue (*SGnd*)	**Not used**
Green (*Tx*)	**Not used**
Black (*SGnd*)	**NMEA - output** (which may also be labeled TX-, Data Out -, or NMEA OUT-, or Ground)

Connecting Directly an Autopilot

Then following cabling instructions apply to most autopilot systems; however, you should also refer to the "Connecting Specific Instruments and Devices" section later in this appendix and to the manual that came with your autopilot. Your autopilot must support NMEA 2.1 strings APA or APB.

To connect directly to an autopilot, refer to Figure A-1 and Table A-4.

Table A-4. Connecting Navigator Directly to Autopilot System

Connect Cable Color:	To Autopilot Lead:
Yellow (*Rx*)	**Not used**
Blue (*SGnd*)	**Not used**
Green (*Tx*)	**NMEA + input** (which may also be labeled RX, RX+, Data In+, or NMEA IN+)
Black (*SGnd*)	**NMEA - input** (which may also be labeled RX-, Data In -, or NMEA IN-, or Ground)

Connecting Specific Instruments and Devices

The subsections that follow explain how to connect Navigator to various manufacturers' instruments and devices.

Connecting to a Raymarine Direct SeaTalk™ Interface

You connect Navigator to a Raymarine Direct SeaTalk interface (Part No. E85001) using Cable Part No. E86001 as shown in Figure A-2. This interface converts the SeaTalk data format into RS-232 signals and vice-versa. When configuring your instrument connections within Navigator, the COM port to which SeaTalk is connected to must be set to: **Raymarine Direct SeaTalk Interface**.

Note: *Not all SeaTalk features are supported by the Z290 SeaTalk-to-NMEA converter. If you are using an old Z290, you must set the COM port to which it is connected to:* **NMEA 183 Instruments**.
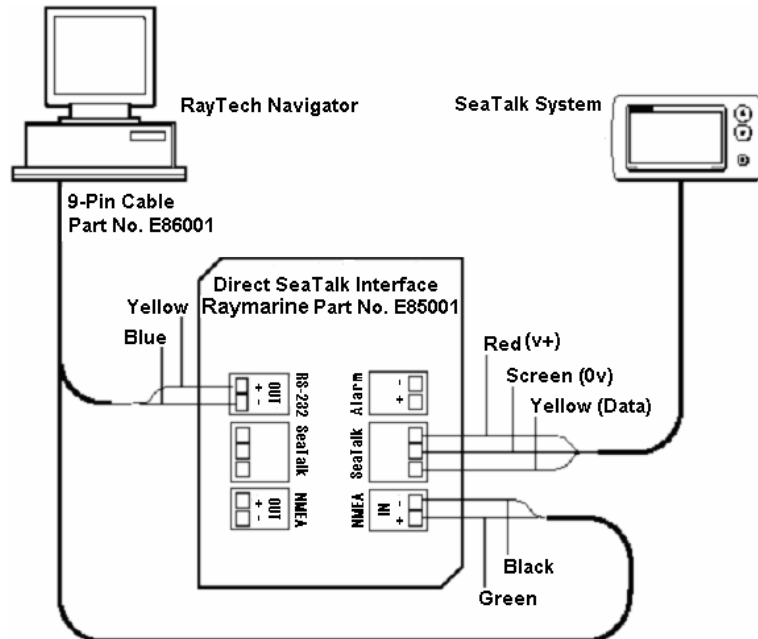
Figure A-2. Raymarine Direct SeaTalk Interface, Part No. E85001

Connecting to a Raytheon Autohelm System

The optimum way to connect Navigator to a Raytheon Autohelm system is to use the Direct SeaTalk Interface, Raymarine Part No. E85001 (Figure A-2). You can also use a Z290 SeaTalk-to-NMEA converter for this connection; however, keep in mind that not all SeaTalk features are supported by the Z290. Therefore, to ensure full communications, we recommend that you use the Direct SeaTalk Interface.

To connect directly to a Raytheon Autohelm system, refer to Figure A-1 and Table A-5.

Table A-5. Connecting Navigator Directly to Raytheon Autohelm

Connect Cable Color:	To NMEA Instrument Lead:
Yellow (*Rx*)	**RS-232 + output**
Blue (*SGnd*)	**NMEA - input** (which may also be labeled RX-, Data In -, or NMEA IN-, or Ground)
Green (*Tx*)	**NMEA + input** (which may also be labeled RX, RX+, Data In+, or NMEA IN+)
Black (*SGnd*)	**NMEA - output** (which may also be labeled TX-, Data Out -, or NMEA OUT-, or Ground)

Connecting to B&G Instruments

Navigator connects to the B&G 290, 390, 690, 790, and 2000 instrumentation systems through the B&G Performance Board or through a B&G NMEA FFD display. (For other B&G instruments, refer to "NMEA Basics," earlier in this appendix.) Using the B&G Performance Board has the advantage of enabling Navigator to automatically send data back to the B&G unit for remote display.

To connect Navigator to a B&G Performance Board:

1. Install a jumper on the Performance Board between the RTS Pin and the CTS Pin.

2. Set the Output Baud Rate setting (Cross-Track Error calculation value 2) to 6.4bps. Refer to the B&G manual for instructions.

3. Refer to Figure A-1 and Table A-6 to make the connections.

Table A-6. Connecting Navigator to a B&G Performance Board

Connect Cable Color:	To Performance Board Pin:
Yellow (*Rx*)	**Pin 10**
Blue (*SGnd*)	**Not used**
Green (*Tx*)	**Pin 9**
Black (*SGnd*)	**Pin 11**

To connect to a B&G NMEA FFD display, refer to Figure A-1 and Table A-7.

Table A-7. Connecting Navigator to a B&G NMEA FFD Display

Connect Cable Color:	To NMEA FFD Lead Color:
Yellow (*Rx*)	**Violet** (NMEA Output)
Blue (*SGnd*)	**Not used**
Green (*Tx*)	**Not used**
Black (*SGnd*)	**Black** (Ground)

Connecting to KVH Instruments

Navigator connects to KVH instruments via KVH's NMEA Box or Race Box interface devices. Connecting via the Race Box offer the advantage of automatically sending Navigator data back to the KVH system's displays. If you use the Race Box, you will also need the NMEA Box, because the Race Box doesn't propagate all of the NMEA data.

To connect to a KVH Race Box, refer to Figure A-1 and Table A-8. (To connect to an NMEA Box, refer to "NMEA Basics," earlier in this appendix.)

Table A-8. Connecting Navigator to a KVH Race Box

Connect Cable Color:	To Race Box Terminal:
Yellow (*Rx*)	**NMEA Interface Terminal 13** (*Tx NMEA*)
Blue (*SGnd*)	**NMEA Interface Terminal 14** (*Negative*)
Green (*Tx*)	**Race Interface Terminal 3** (*Rx NMEA*)
Black (*SGnd*)	**Race Interface Terminal 5** (*Negative*)

Connecting to Ockam Instruments

Navigator connects to Ockam instruments via Ockam's Model 050D RS-232 Interface (which you must supply). You must also set two switches on the Ockam unit.

> **Note:** *You can connect Navigator to any model Ockam RS-232 Interface; however, to ensure optimum reliability of the data transfer, we recommend that you use Ockam Model 050D.*

To connect to an Ockam Model 050D RS-232 Interface:

1. Set Switch **S1** on Model 050D to **4**.

2. Set Switch **S2** to **D**.

3. Refer to Figure A-1 and Table A-9 to make the required cable connections.

Table A-9. Connecting Navigator to an Ockam 050D RS-232 Interface

Connect Cable Color:	To Ockam 050D Pin:
Yellow (*Rx*)	**Pin 4**
Blue (*SGnd*)	**Not used**
Green (*Tx*)	**Pin 2**
Black (*SGnd*)	**Pin 1**

Basic NMEA and RS-232 Cabling Principles

This section explains some of the basic principles involved with National Marine Electronics Association (NMEA) and RS-232 electrical connections. Knowledge of this information is not required to connect Navigator to the various peripheral devices; however, it is provided for the advanced user as pertinent technical background.

NMEA Basics

Most marine electronic devices that output data do so over NMEA ports. NMEA ports are known as a "balanced pair," which means that the data signal is carried over two wires (via an RS-422 electrical layer, in computer/datacom terminology). The signal level is determined by calculating the voltage difference between the two wires, hence the NMEA output signal is called a Differential Data Signal (not to be confused with Differential GPS, which is a GPS system error correction method).

Differential Data Signals are designed to be error-resistant by keeping the positive and negative leads close together for the entire cable run. This means that they both pick up the same levels of noise, which is ultimately subtracted from the signal, preserving the signal's data integrity. NMEA ports typically have four connections (two for each lead): Transmit (positive/negative) and Receive (positive/negative). Some devices may use a single-direction port, meaning that they can transmit or receive only.

When connecting one NMEA device to another:

1. Connect Device A's positive Transmit (*Tx+*) lead to Device B's positive Receive (*Rx+*) lead.

2. Connect Device A's negative Transmit (*Tx-*) lead to Device B's negative Receive (*Rx-*) lead.

Important: when performing the above connection, be sure you connect the devices directly; do not use the vessel's DC ground circuit to carry the Transmit (negative) signal. You may encounter devices that do not properly implement the NMEA specification, and share their Transmit (negative) lead with the device's DC power ground circuit. In this case, you must still run a cable directly between the Transmit (negative) and Receive (negative) leads as previously stated — do not share the DC power ground circuit.

RS-232 Basics

Most desktop and laptop computers have RS-232 ports. An RS-232 port uses a 3-wire interface, in which the transmit and receive leads reference the same signal ground. It is important not to confuse the RS-232 cable's signal ground with the vessel's power ground circuit. While the vessel's power ground may coincidentally be at the same level as the RS-232 signal ground, there is no industry standard that requires this. Since the RS-232 transmit and receive data signals reference a common signal ground to maintain their integrity, you must connect the signal ground circuit directly between the two RS-232-linked devices.

To wire an RS-232 device to another RS-232 device, connect:

1. Device A's *Tx* lead to Device B's *Rx* lead.

2. Device A's *Rx* lead to Device B's *Tx* lead.

3. Device A's Signal Ground (*SGnd*) lead to Device B's *SGnd* lead.

RS-232 uses a common ground, which differs in electrical specification from the NMEA's transmit/receive-pair arrangement. Because of these signal level differences, the way you interconnect an RS-232 device and an NMEA device varies with the application.

> **Note:** *You may also encounter voltage differences when interconnecting older RS-232/NMEA hardware - use care.*

To wire an RS-232 device <u>to provide input to</u> an NMEA device:

1. Connect the RS-232 Device's *Tx* lead to the NMEA Device's *Rx+* lead.

2. Connect the RS-232 Device's *SGnd* lead to the NMEA Device's *Rx-* lead.

To wire an RS-232 device <u>to receive input from</u> an NMEA device:

1. Connect the RS-232 Device's *Rx* lead to the NMEA Device's *Tx+* lead.

2. Connect the RS-232 Device's *SGnd* lead to the NMEA Device's *Tx-* lead.

To wire an RS-232 device <u>to provide input to</u> **and** <u>receive input from</u> an NMEA device:

1. Connect the RS-232 Device's *Tx* lead to the NMEA Device's *Rx+* lead.

2. Connect the RS-232 Device's *Rx* lead to the NMEA Device's *Tx+* lead.

3. Connect the RS-232 Device's *SGnd* lead to the NMEA Device's *Tx-* <u>and</u> *Rx-* leads.

There are some infrequent cases where binding the NMEA device's *Tx-* and *Rx-* leads together may cause difficulties. If you do encounter problems, you'll need to use an RS-232-to-NMEA converter between the two devices. A converter is typically required very rarely (in less than 1% of applications; however, the modern Furuno radar systems, for example, do require them), but is still a good place to begin trouble-shooting if problems arise with the RS-232/NMEA interconnection.

Circuit Grounding Issues

By far the most important issue in electrical connections is proper circuit grounding. In addition to all the other electrical gremlins that poor grounding gives rise to, instrument signals are easily scrambled if they are badly grounded, resulting in erratic and unreliable displays. Installations with both AC and DC current have separate ground circuits for each. In such cases, the use checklist that follows to ensure that the AC and DC ground circuits are kept fully isolated:

☑ Use isolating transformers or a separate power-inverter to run PC, monitors, and other sensitive electronic instruments or devices.

☑ Use an isolating transformer with weather FAX audio cables.

☑ Use an RS-232/NMEA converter with optical isolation on the signal lines.

☑ Use PCs and other devices that are directly DC powered.

Proper Cable Shielding

For all but the shortest length cable runs, data cables must be shielded to prevent them from picking up electrical noise from other devices and to keep them from radiating potential interference. If you encounter a data corruption problem, a good place to begin trouble-shooting is with the cable's shielding, especially on longer runs. Make sure the cable's shielding hasn't been scrapped off by being squeezed through a tight area.

Preventing Interference and Crosstalk

You should always run data cables as isolated as possible, and as far away from high current carrying AC and DC power lines and antennas as possible. While it may be convenient, bundling power and data cables together causes crosstalk between them, resulting in scrambled and unusable data. If you must cross power cables when running data cables, try to make the crossing as close to 90° as possible; never run power and data cables parallel within the same bundle. If you have long runs planned for your data cables, and are using NMEA equipment, use shielded twisted-pair cable to eliminate the danger of interference and crosstalk.

Connecting With a KiwiTech Cable

The section gives the pin/lead configurations for the earlier KiwiTech 9- and 25-pin NMEA cables (Tables A-10 and A-11). For optimum Navigator performance, we recommend that you update and use Raymarine Cable Part No. E86001.

Table A-10. Pin/Lead Configuration for 9-Pin KiwiTech NMEA Cable

9-Pin Serial Connector	PC Cable Color	Direct SeaTalk Interface	NMEA GPS
Pin 2	Red	+RS232 Out	Data Out
Pin 3	White	+NMEA In	Data In
Pin 5	Green	-NMEA In -RS232 Out	Ground

Table A-11. Pin/Lead Configuration for 25-Pin KiwiTech NMEA Cable

25-Pin Serial Connector	PC Cable Color	Direct SeaTalk Interface	NMEA GPS
Pin 2	White	+RS232 Out	Data In
Pin 3	Red	+NMEA In	Data Out
Pin 7	Green	-NMEA In -RS232 Out	Ground

RayTech Navigator Version 4.1

This interim sheet describes enhancements made to RayTech Navigator version 4.1 that are not described in the User's Guide.

Route Enhancements

Waypoint/Route Transfer   Waypoint Transfer

RayTech V4.1 introduces a revised feature that enables you to export your waypoints and routes to a file, or send them by e-mail, or transfer them to/from a Raymarine electronic device via *hsb²*.

➤ To transfer a waypoint or route:

1. Click the **Waypoint Transfer** button on the Route toolbar.
   or
   Select **Waypoint Transfer** from the Waypoint menu.
   The Waypoint(/Route) Transfer dialog appears.
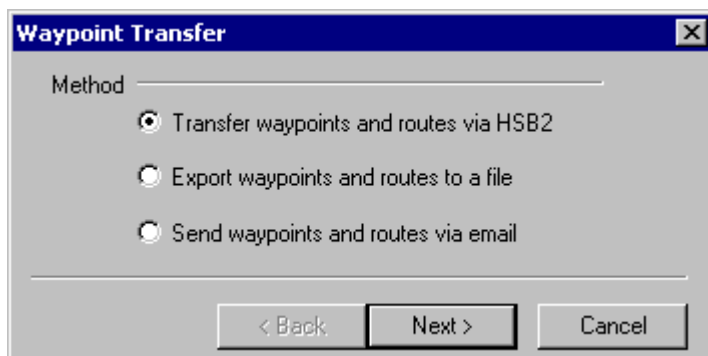
2. Select the Method by which you wish to send the waypoint/route. These Waypoint/Route transferring methods are described in the following sections.

Transfer via *hsb²*

You have the option of sending or receiving the waypoints and routes to/from a Raymarine electronic device, such as a radar/chartplotter display.

➤ To send waypoints/routes via *hsb²*:

Note: *Before transferring waypoints/routes to a Raymarine electronic device, you must first configure the unit to receive waypoints via hsb².*

1. Select **Transfer waypoints and routes via HSB2** from the Waypoint Transfer dialog.

2. Click **Next**.
    The HSB2 Waypoint Transfer dialog appears.
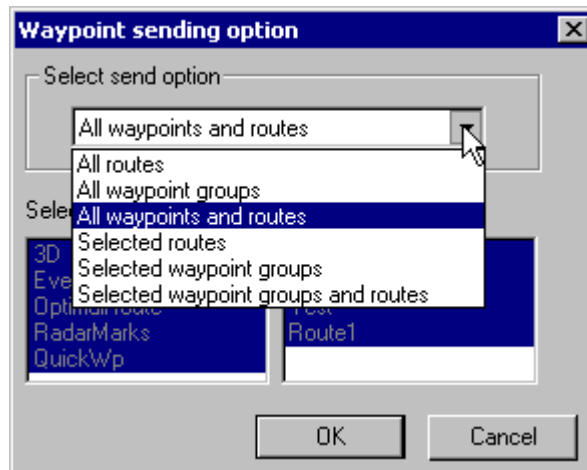
3. Click the **Change Option** button.
    The Waypoint Sending Option dialog appears.

4. Select the waypoints/routes you wish to send.

5. Click **OK**.

By default, the Waypoint/Route Transfer feature transfers all waypoints and routes stored by RayTech. Raymarine electronics have storage limits of 1000 waypoints and 20 routes, each containing a maximum of 50 waypoints. RayTech does not have such a limitation. If you attempt to transfer a quantity of waypoints/routes that exceeds the waypoint/route storage capacity of the Raymarine electronic device, RayTech notifies you accordingly.

6. When you are satisfied with the list of waypoints/routes to be transferred, click the **Send** button.
    The waypoints/routes are transferred to the electronic device, preserving waypoint and route names. The button now reads **Stop sending**.
    RayTech notifies you when the transfer has been completed.

Note: *The hsb² waypoint/route transfer process overwrites the entire waypoint/route list in the receiving electronic unit.*

7. If the transfer does not complete or you wish to abort, click **Stop sending**.

➤   To receive waypoints/routes via *hsb²*:

Note: *Before transferring waypoints/routes from a Raymarine electronic device, you must first configure the unit to transmit waypoints via hsb².*

1. Select **Transfer waypoints and routes via HSB2** from the Waypoint Transfer dialog.

2. Click **Next**.
    The HSB2 Waypoint Transfer dialog appears.

3. Click the **Receive** button on the HSB2 Waypoint Transfer dialog.
    The waypoints/routes are transferred from the electronic device to Ray-Tech, preserving waypoint and route names and the button label changes to **Stop receiving**.
    All received waypoints are assigned to the 'HSB2' group.

4. If the transfer does not complete or you wish to abort, click **Stop receiving**.

Export to a File

➤   To export waypoints/routes to a file:

1. Select **Export waypoints and routes to a file** from the Waypoint Transfer dialog.

2. Click the **Change Option** button to select the waypoints/routes to be sent, as described in the preceding section **Transfer via *hsb²***.

3. Click **Save Now**.
    The Save As dialog appears.

4. Browse to the location where you would like the file to be stored.

5. Click **OK**.
    The file is stored in the designated location with the extension RWF.

6. Click **Cancel** to close the dialog.

Transfer via e-mail

➤   To transfer waypoints/routes via *hsb²*:

1. Select **Send waypoints and routes via email** from the Waypoint Transfer dialog.

2. Click **Next**.
    The Waypoint Transfer dialog appears.

3. Click the **Change Option** button to select the waypoints/routes to be sent, as described in the preceding section **Transfer via *hsb²***.

4. Click **Send Now**.
    A new mail message appears, containing a waypoint attachment file.

5. Enter the recipient's e-mail address in the **To** field of the mail message.

6. Click the **Send** button to send the mail.
   RayTech notifies you that your message was sent.

7. Click **Cancel** to close the dialog.

Create Route

RayTech V4.1 introduces an additional chart panning feature that assists
users of the Create Route feature. The Create Route feature is activated by
selecting the **Create Route** button from the Route toolbar or by selecting
Create Route item from the Route menu.

When in route/waypoint plotting mode, the cursor appears as a crosshair with
a small waypoint symbol adjacent to it. Route waypoints are added each time
you click the left mouse button.

However in RayTech V4.1, as the mouse cursor approaches the bor-
der of a Chart window, the cursor no longer includes the small way-
point symbol, indicating you have switched to chart panning mode.
Now, a left mouse click centers the chart over the point you have
clicked.

Charting Enhancements

C-Map Chart Server/Client

With V4.1, RayTech can be a server or client of C-Map cartography transmitted over the *hsb²* network. As part of a *hsb²* network, RayTech is capable of serving C-Map cartography stored on the PC or read from a C-Map NT card reader. In this same configuration, RayTech can be a client of C-Map cartography served from Raymarine *hsb²* chart plotters.

To use this feature, the RayTech PC must be connected to the *hsb²* network via the RayTech *hsb²* PC kit (Raymarine part number E80019).

Quilting On/Off

With Quilting off, only the chart that is in focus is displayed. When you get to the edge of the chart, you see its border. When you turn on Quilting, all quilted charts are viewable in that chart window. Chart borders are not displayed; when you pan to a chart's edge, RayTech transitions to the next chart.

RayTech V4.1 features additional mechanisms for controlling quilting. In the Chart Info dialog, there is a checkbox for including a chart in the quilt and a button for displaying a chart alone. In the Chart Layers Toolbar is a new **Quilting** button for turning the feature on and off.

Zoom Control

RayTech V4.1 has a smooth zoom feature in which you can progressively zoom in and out of the chart by selecting the:

- **Range** button on the Pathfinder Panel
- Computer's Tab (zoom in) and Shift+Tab (zoom out) keys
- Mouse wheel

Chart Information

RayTech V4.1 introduces a chart information feature. To access chart information for the chart that is currently in focus, click the right mouse button and select **Chart Info** from the pop-up menu.

The Chart Info dialog lists the chart name, scale, vendor, depth units, source, edition, projection, and the filename that RayTech used to save the chart during installation. The filename is constructed from the chart number. The Chart Info dialog features a checkbox that can be used to include or exclude the chart from the quilt. The Chart Information dialog also features a **Show chart alone** button. When this button is selected, the current chart window displays the selected chart by itself.

Chart Info

```
FLORIDA KEYS SOMBRERO KEY TO DRY
Scale : 180000
Maptech Raster Chart
Depth Units : FATHOMS
Chart Source : USA-NOAA/NOS
Edition : 93237409
Updated :
Projection : MERCATOR
FILE : 11434_1.RRF
```

☑ Included in Quilting

[Show chart alone]   [Close]

New Databoxes

Databox displays enable you to place vital navigation data where you want it. The databoxes can be customized for content, size, color, position, and font, ensuring a bright, clear view.

New to RayTech V4.1 are additional databox radar channels for MARPA, VRM, EBL, radar bearing/range and radar cursor latitude/longitude.

Position Reporting

New in RayTech Navigator 4.1 is the capability to send and receive automated vessel position reports. The position reports are compiled on a user-selectable time interval and are automatically deposited into your MAPI compliant e-mail client (such as Microsoft Outlook, Outlook Express) for transmission by cellular, satellite or SSB e-mail. Upon delivery to the recipient, the position report can be automatically decoded and plotted on any other PC running RayTech Navigator 4.1. Over time, RayTech Navigator will develop a plot right on screen of where the vessel has been.

This feature is particularly useful to the offshore cruiser, racer, fishermen, or anyone who wants to easily and effectively communicate their vessels position to other boaters, to friends and family at home, or to a race safety committee. RayTech 4.1's position reporting is the backbone of the vessel reporting system for the 2002-2003 Around Alone offshore sailing race.

Position reporting works in conjunction with RayTech's automated weather services.

➤ To set up your position report:

1. Click on the File menu and select **Get Weather from the Internet**. The RayTech Internet Weather window appears.

2. Click the **Advanced** button of the E-Mail Request tab to set up position reporting and advanced weather services.

3. Find the **Automatic Position Report** section under advanced setup.

4. In the **Send To** field, enter the address to which you would like the position report sent. If there is more than one address you want to send to, enter all of them, separated by commas.

5. In the **Frequency** drop down box, select how often a position report will be sent. Standard intervals range between 1 and 24 hours.

6. In the **Boat name** field, enter the name, call sign, or other identification for your vessel.

7. Send a position report immediately by clicking the **Send Now** button.

For the automated position (and weather) functions to operate, you leave the Internet Weather application and your e-mail client open. At the interval specified, a new position report is generated, and passed to the e-mail client's outbox for transmission.

If your e-mail system is not automatic, the position report will remain in the outbox until you reconnect to your e-mail. At that time, any outgoing traffic is sent and any incoming reports or weather files are received.

Auto Processing of Incoming Position Reports and Weather

RayTech Navigator 4.1 can automatically process, decode and plot incoming position reports and GRIB weather overlays from your e-mail inbox. To do this, you must make sure the RayTech Internet Weather application and your e-mail client are running.

It may be beneficial to add shortcuts to the weather and e-mail programs to your Windows 'Startup' group, ensuring that they run every time the PC is rebooted. The setup for this feature is located within the Advanced weather dialog, outlined in the preceding section **Position Reporting**.

To schedule RayTech to automatically check the e-mail inbox for new message traffic, specify a time interval in the Frequency drop-box, located under the Automatically Send Files section.

Other Vessel Tracking

The Other Vessel Tracking feature has been enhanced to enable you to delete the schedule of any tracked vessel and filter entries by boat name and by time.

Other Vessel Tracking works in conjunction with the Position Reporting system, enabling the navigator or racer to monitor the positions of other vessels traveling in company or under race conditions. It is accessed by clicking on the Tools menu and selecting **Other Vessel Tracking**.

DataTrak Enhancements

The DataTrak module is a time-based, graphical recording system included with RayTech Sail Racer and RayTech Fishing Pro Suites. DataTrak script charts can be resized to fixed time intervals for quick data capture. This is invaluable to the navigator in capturing data for target and polar calculations or trying to ascertain minute changes in any recorded variable overtime.
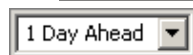
Navigator 4.1 now allows for the display of DataTrak wand times. When capturing data from the DataTrak, vertical frames can be inserted in the chart delineating start and end points for the data capture. These lines, called wands, represent a particular segment of time on the graph. The time interval is reported at the top of the graph, in the blue status bar.

Animation Enhancements

When displaying weather layers on the chart you can animate the information to view weather changes over time. To animate this data, display weather layers information on the chart and select the Animation Toolbar from the View menu. Then choose from the following items on the Animation Toolbar. Features marked with an asterisk (*) are new to V4.1.
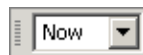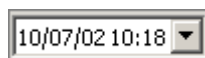
Now	Sets the Relative Start Date/Time
1 Day Ahead	Sets the Relative Stop Date/Time
	Sets the Animation Speed. Move the slider to the right/left to increase/decrease animation speed.
10/07/02 10:18	Displays current animation time/date. Click on a date or time field, and then edit or use the computer's up/down arrow keys to increment/decrement.*
▶ ❙❙	Plays/Pauses the animation
« »	Rewinds/Fast Forwards in increments *
▶❙	Goes to end of the animation time

Raymarine